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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appellant : Mark D. Conover

Docket no. 2134

Serial no : 09/168,644

Filed : October 8, 1998

For : ENCODING A STILL IMAGE INTO COMPRESSED VIDEO

Art Unit : 2613

Examiner: Richard Lee

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12-17-01

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APPEAL BRIEF TRANSMITTAL

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APPEAL BRIEF

Pursuant to 37 C.F.R. § 1.192, through his undersigned attorney the Appellant submits the following appeal brief in triplicate.

Real Party in Interest

The real party in interest is Pixel Tools Corporation, a California Corporation having an office at 10721 Wunderlich Drive, Cupertino, California 95015.

Related Appeals and Interferences

Appellant is unaware of any presently pending appeal or interference that is related to this appeal.

Status of the Claims

Claims 1-7 are pending in this application, claims 1-7 have been finally rejected, and that rejection of claims is being appealed.

Status of Amendments

Appellant presented an amendment of independent claim 1 which corrects a grammatical error after an Examiner's Action, Paper No. 5, mailed June 8, 2001, finally rejected claims 1-7. An Advisory Action, Paper No. 9, mailed October 19, 2001, states that the amendment presented after final rejection will be entered upon filing of a Notice of Appeal and this Appeal Brief with required fees.

Dependent claims 2, 3 and 5 were last amended in a response to a first Examiner's Action dated December 6, 2000, Paper No. 2, that Appellant mailed on April 4, 2001. The response that was mailed on

April 4, 2001, also presented for the first time new dependent claims 6 and 7.

Summary of the Invention

As recited in twice amended independent method claim 1, the present invention encompasses:

> [a] method for producing a compressed video bitstream that includes compressed video data for a plurality of frames from data that specifies a single still image
>
> * * *
>
> whereby decoding of the compressed video bitstream produces frames of video which produce images that do not appear to pulse visually.

The invention solves a problem that appears in images produced by a conventional MPEG decoder when decoding a conventionally MPEG encoded video bitstream that reproduce a still image, particularly a still image containing text.

A conventionally encoded MPEG video bitstream includes a sequence of groups of pictures ("GOPs") one of which is identified in FIG. 2 by reference number 52. Each GOP begins with an intra ("I") frame that usually precedes at least one predicted ("P") frame and several bidirectional ("B") frames . Detail in decoded MPEG still images tends to be lower at the beginning of each GOP when an I frame is decoded, increases during decoding of successive P frames and B frames in the GOP, only to decrease again upon decoding the next I frame.

Thus, decoding the conventionally encoded MPEG compressed video bitstream of a still image frequently produces a video image

that appears to pulse visually, usually at a frequency identical to the frequency at which GOPs occur in the compressed video bitstream, e.g. twice per second. In many instances, visual pulsing of the still image produced by decompressing a MPEG compressed video bitstream is commercially unacceptable.

As recited in independent claim 1, the method which solves the problem of visual pulsing of images produced from a video bitstream that is conventionally MPEG encoded from a still image that the present patent application claims:

1. fetches data for the still image;
2. encodes the data for the single still image into data for an I frame;
3. stores the encoded I frame data; and
4. assembles the compressed video bitstream by appropriately combining data for:
   a. at least a single copy of the stored I frame;
   b. at least one null frame; and
   c. various headers required for decodability of the compressed video bitstream.

The Issues

1. Whether claims 1-7 are unpatentably obvious under 35 U.S.C. § 103(a) over:
   a. United States Patent no. 5,689,589 entitled "Data Compression for Palettized Video Images" which

issued on an application filed December 1, 1994, by Michael J. Gormish and Martin P. Boliek ("the Gormish, et al. patent"):

b. in view of:

i. United States Patent no. 5,404,446 entitled "Dual Buffer Video Display System for the Display of Asynchronous Irregular Frame Rate Video Data" which issued April 4, 1995, on an application filed by Ronald J. Bowater, Barry K. Aldred and Stephen P. Woodman ("the Bowater, et al. patent") and

ii. United States Patent no. 5,838,678 entitled "Method and Device for Preprocessing Streams of Encoded Data to Facilitate Decoding Streams Back-to Back" which issued on an application filed July 24, 1996, by Joseph W. Davis and Shawn M. Hayes ("the Davis, et al. patent").

2. Whether claims 2 and 3 are unpatentably indefinite under 35 U.S.C. § 112, second paragraph for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim Group

Claims 1-3's and 6-7's rejection under 35 U.S.C. § 103(a) stand or fall by themselves.

Claim 4's rejection under 35 U.S.C. § 103(a) stands or falls by itself.

Claim 5's rejection under 35 U.S.C. § 103(a) stands or falls by itself.

Claims 2's and 3's rejection under 35 U.S.C. § 112, second paragraph, stands or falls by itself.

Argument

Table of Contents

The Cited References

The Gormish, et al. Patent

Exhibit A to this Appeal Brief presents those FIGs. and texts in the Gormish, et al. patent that are pertinent to the invention encompassed by the pending claims. The FIGs. and texts in Exhibit A hereto establish that during the processing of "frame sequence data"[1] the frame store 204C, illustrated in FIG. 2 of the Gormish, et al. patent, is:

1. initially empty and is unable to provide any context for very early pixels[2];
2. at the end of processing each pixel, to prepare for processing the next pixel, the context modeler 202C:
   a. cycles UCLK to update frame store 204C (C13); and
   b. then cycles PCLK to get the next pixel (C14)[3];
3. during pixel processing, the context modeler 202C:
   a. loads the current pixel into pixel register 402[4]
   b. CP register 408 of the context modeler 202C "addresses" frame store 204C to obtain the context pixels for the current pixel[5];

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[1] The Gormish, et al. patent col. 4, lines 55-58.

[2] The Gormish, et al. patent col. 7, lines 17-18.

[3] The Gormish, et al. patent col. 11, lines 11-13.

[4] The Gormish, et al. patent col. 9, line 20-21.

[5] The Gormish, et al. patent col. 9, lines 21-23.

c. determines the sameness context model and the residual context model and loads SMASK and RMASK (step C1)[6]; and

d. reads T from frame store 204C and X from pixel register 402. and tests whether or not the current pixel is the same as the corresponding pixel from a previous frame, i.e. performs the sameness test X==T[7];

4. as the frame store 204C fills, the data for the oldest pixels are overwritten as new pixels are stored there[8];

5. frame store 204C need only be large enough to hold the values needed to determine future contexts[9];

6. if frame store 204C has enough space to hold the current pixel without overwriting any pixels which form the context for the current pixel, then PCLK can be substituted for UCLK[10] and

7. if no context referred to pixel values from frames earlier than the immediately prior frame, storage is only needed for one full frame[11].

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[6] The Gormish, et al. patent col. 10, lines 28-29.

[7] The Gormish, et al. patent col. 10, lines 38-46.

[8] The Gormish, et al. patent col. 7, lines 21-23.

[9] The Gormish, et al. patent col. 7, lines 23-25.

[10] The Gormish, et al. patent col. 9, lines 5-8.

[11] The Gormish, et al. patent col. 7, lines 25-27.

The texts from the Gormish, et al. patent presented in Exhibit A and the preceding summary thereof irrefutably establish that:

1. the disclosed method operates on a sequence of image frames; and
2. **at no time does the frame store 204C depicted in FIG. 2, store an encoded I frame of data** as alleged in the Examiner's Action dated June 8, 2001, in lines 3-4 on page 3 thereof.

Rather, the text of the Gormish, et al. patent at best discloses that the frame store 204C:

1. stores only unencoded pixel values for those pixels which precede the present pixel; and
2. supplies unencoded pixel values to the context modeler 202C for use in performing the sameness test X==T.

That is, **the Gormish, et al. patent does not disclose a transfer of pixel values stored in the frame store 204C through the entropy coder 208C into the compressed file 220**.

Regarding the storage capacity of the frame store 204C, it need only be large enough to hold the values needed to determine future contexts.[12] However, the amount of data preserved in the frame store 204C depends upon the particular context model performed by (implemented in) the context modeler 202C. Therefore, the frame store 204C may store unencoded pixel values for more than one frame if:

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[12] The Gormish, et al. patent col. 7, lines 23-25.

1. required to do so by the context model performed by (implemented in) the context modeler 202C; or
2. has enough space to hold the current pixel without overwriting any pixels which form the context for the current pixel.

As set forth in Exhibit A, the block diagram FIG. 3 depicts a decompressor 122 whose operation is illustrated in the flow chart of FIG. 7. The Gormish, et al. patent discloses merely that a context modeller 202D of the decompressor 122 stores pixels into and retrieves pixels from the frame store 204D[13].

Despite repeated diligent searches of the Gormish, et al. patent, Appellant is able to find in that reference:

1. **only a single mention of a "still image 104"[14]; and**
2. **not a single additional occurrence of:**
   a. **the word "still;" or**
   b. **the reference number 104;**

   anywhere else throughout that entire reference including the reference's claims.

Regarding the text in the Gormish, et al. patent identified in the Examiner's Action dated June 8, 2001,[15] Appellant is able to find in that text only a single instance which mentions the "still image 104." Appellant is unable to find in the cited text, or anywhere

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[13] The Gormish, et al. patent col. 12, lines 14-20.

[14] The Gormish, et al. patent col. 4, line 50.

[15] The Gormish, et al. patent col. 4, lines 49-65.

else in the Gormish, et al. patent, any further discussion regarding the still image 104, or regarding an I frame, i.e. a frame of compressed video data which can be decoded without reference to data in another frame of video data.

Despite repeated diligent searches of the Gormish, et al. patent, Appellant is unable to find therein any disclosure or suggestion of:

1. encoding data for a still image into data for an I frame as expressly required by independent claim 1; or
2. a null frame; or
3. combining data for the I frame with that for a null frame.

Correspondingly, despite repeated diligent searches of the Gormish, et al. patent, Appellant is unable to find therein any disclosure or suggestion that decoded still images that have been encoded in accordance with the reference's disclosure do not pulse visually.

The Bowater, et al. Patent

The Bowater, et al. patent addresses the technological problem that:

> [i]n computer-based video communication systems, a video signal is obtained from the camera at a constant frame rate but, **after transmission across the asynchronous or non-ideal network, the frames arrive at irregular intervals. Some frames arrive early, some are delayed, and bunching can occur.** The display device at the receiving terminal, however, generally requires a constant frame rate supplied to it (e.g., to match the raster scan rate of a CRT). In such systems it is therefore necessary to match the irregular arrival of

> frames over the network with the constant supply required to the output screen.
>
> * * *
>
> The designer of computer based video communication systems is . . . faced with the problem of how to achieve regular play-out of the asynchronous incoming video signal while, at the same time, minimising the number of buffered video frames. (Col. 1, lines 38-64) (Emphasis supplied.)

Exhibit B to this Appeal Brief presents those FIGs. and texts in the Bowater, et al. patent that are pertinent to the invention encompassed by the pending claims. The FIGs. and texts in Exhibit B hereto establish that the Bowater, et al. patent, discloses:

1. an apparatus and procedure for buffering motion video data in a decoding device prior to displaying an image on a screen that accommodates irregular arrival of frames of video data due to their transmission across an asynchronous or non-ideal network;[16] and
2. accommodating insufficient data arriving at the decoding device via the asynchronous or non-ideal network by:
   a. temporarily freezing the image appearing on the screen by adding null frames;[17] and
   b. subsequently throwing away real data when data of the delayed frames of data does arrive.[18]

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[16] The Bowater, et al. patent col. 1, lines 40-49.

[17] The Bowater, et al. patent col. 3, line 65 - col. 6, line 28.

[18] The Bowater, et al. patent col. 4, lines 29-41.

Despite diligently searching the Bowater, et al. patent, Appellant is unable to find there any disclosure or even a suggestion that the disclosed buffering technique prevents still images from pulsing visually.

The Davis, et al. Patent

FIGs. 2, 3A, 3B, 5 and 6 of the Davis, et al. patent respectively illustrate:

1. FIG. 2, the syntax of an MPEG II PES packet;
2. FIGS. 3a and 3b, the organization of an MPEG II video sequence;
3. FIG. 5, the structure of a picture header of the MPEG II video sequence of FIGS. 3a and 3b; and
4. FIG. 6, the structure of a group of pictures header of the MPEG II video sequence of FIGS. 3a and 3b.

The Davis, et al. patent provides the illustrations listed above as background art necessary for a proper understanding of the invention which that reference's discloses.

Exhibit C to this Appeal Brief presents those FIGs. and texts in the Davis, et al. patent that are pertinent to the invention encompassed by the pending claims. The FIGs. and texts in Exhibit C hereto establish that the problem solved by the Davis, et al. patent is eliminating a one (1) second delay that occurs if both

the video decoder and the audio decoder must be reset before beginning to decode a subsequent program.[19]

To solve the preceding technological problem the Davis, et al. patent discloses a method which:

1. first verifies that the multiplexed stream complies with an encoding standard;[20]
2. preprocesses packets of the packetized and encoded:
   a. video sequence such that no video artifacts are produced when the video decoder decodes the immediately following encoded video sequence;[21] and
   b. audio data sequence such that its:
      i. start time is within a first predetermined time of the start time of the video sequence;[22] and
      ii. temporal length is within a second predetermined time of the temporal length of the video sequence.[23]

The step of preprocessing the packets of the packetized, encoded, video sequence preferably includes deleting any video frames:

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[19] The Davis, et al. patent col. 5, lines 3-6.

[20] The Davis, et al. patent col. 6, lines 3-5.

[21] The Davis, et al. patent col. 6, lines 5-8.

[22] The Davis, et al. patent col. 6, lines 8-11.

[23] The Davis, et al. patent col. 6, lines 11-13.

1. that cannot be decoded if video frames of the video sequence are not temporally correct;[24] and
2. following a code indicating an end of the encoded video sequence.[25]

The step of preprocessing the packets of the packetized, encoded, audio sequence preferably includes:

1. removing any partial audio frames;[26]
2. adjusting the number of audio frames, if necessary:
    i. so the audio and video sequences start within the first predetermined time;[27] and
    ii. such that the temporal lengths of the audio and video sequences are within the second predetermined time.[28]

Despite diligently searching of the Davis, et al. patent, Appellant is unable to find:

1. any mention there that the disclosed preprocessing method may be used advantageously in encoding still images in accordance with the MPEG I or MPEG II standards, or
2. using null frames in any compressed video encoding.

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[24] The Davis, et al. patent col. 6, lines 15-17.

[25] The Davis, et al. patent col. 6, lines 17-19.

[26] The Davis, et al. patent col. 6, lines 19-21.

[27] The Davis, et al. patent col. 6, lines 21-24.

[28] The Davis, et al. patent col. 6, lines 24-27.

Furthermore, despite diligently searching the Davis, et al. patent Appellant is also unable to find any disclosure or suggestion that the disclosed preprocessing technique prevents still images from pulsing visually.

Thus, at best, the Davis, et al. patent discloses:

1. in FIGs. 2, 3A, 3B, 5 and 6 some information about how compressed video data may be encoded in accordance with the MPEG standard; and
2. that video data compressed in accordance with the MPEG standard can be pre-processed to avoid a one (1) second gap at junctions between different MPEG encoded programs.

Legal Principles Applicable to Rejections Under 35 U.S.C. 103(a)

Certain well established principles are to be applied in assessing whether or not an invention is patentable under 35 U.S.C. 103(a). First, the claims of a patent, which define the invention, are "to be construed in light of the specification and both are to be read with a view to ascertaining the invention." United States v. Adams, 383 U.S. 39, 49, 148 USPQ 479, 482 (1966). The "differences between the prior art and the claims at issue are to be ascertained." Graham v. John Deere Co., 383 U.S. 1, 17, 148 USPQ 459, 467 (1966). Moreover, it is elementary that the claimed invention must be considered as a whole in deciding obviousness. Litton Industrial Products, Inc. v. Solid State Systems Corp., 755

F.2d 158, 164, 225 USPQ 34, 38 (Fed. Cir. 1985). The prior art as a whole must be considered, and those portions of the prior art arguing against or teaching away from the claimed invention must be considered. Bausch & Lomb, Inc v. Barnes-Hind/Hydrocurve, Inc., 796 F.2d 443, 448, 230 USPQ 416, 420 (Fed. Cir. 1986), In re Hedges, et al., 783 F.2d 1038, 1041, 228 USPQ 685, 687 (Fed. Cir. 1986).

An invention is obvious under 35 U.S.C. § 103(a), only if the prior art suggests a modification of the reference(s) and/or their combination. In In re Gordon, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984) the Court of Appeals for the Federal Circuit ("CAFC") reversed a Board of Appeals decision that a patent application's claims were obvious under 35 U.S.C. § 103 holding "that although a prior art [fuel filter] device could have been turned upside down, that did not make the modification obvious unless the prior art fairly suggested the desirability of turning the device upside down." Continental Can Co. USA, Inc. v. Monsanto Co. 948 F.2d 1264, ___, 20 USPQ2d 1746, 1751 (Fed. Cir. 1991). "The mere fact that the prior art could be . . . modified would not have made the modification obvious unless the prior art suggested the desirability of the modification." In re Gordon, supra at 221, 1127. In accord, In re Laskowski, 871 F.2d 115, 117, 10 USPQ2d 1397, 1398 (Fed. Cir. 1989). "**[E]lements of separate prior patents cannot be combined when there is no suggestion of such combination anywhere in those patents**". Panduit Corp. v.

Dennison Manufacturing Co., 810 F.2d 1561, 1568, 1 USPQ2d 1593, 1597 (Fed. Cir. 1987) citing ACS Hospital Systems, Inc. v. Montefiore Hospital, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). (Emphasis supplied.) **An examiner is obliged to explain why combining references is proper indicating why one skilled in the art would make a combination or substitution.** Ex parte Skinner, 2 USPQ2d 1788, 1790 (Bd. Pat. App. & Int. 1986).

"**When relying on numerous references . . . , . . . the examiner . . . [must] identify some suggestion to combine references or make the modification.**" In re Mayne, 104 F.3d 1339, 1342, 41 USPQ2d 1451, 1454 (Fed. Cir. 1997) citing In re Jones 958 F.2d 347, 351, 21 USPQ2d 1941, 1943-44 (Fed. Cir. 1992). (Emphasis supplied.) "In reviewing the Board's obviousness conclusions, we have been guided by the **well-settled principles** that **the claimed invention must be considered as a whole**, **multiple cited prior art references must suggest the desirability of being combined, and the references must be viewed without the benefit of hindsight afforded by the disclosure.**" In re Paulsen, 30 F.3d 1475, 1482, 31 USPQ2d 1671, 1676 (Fed. Cir. 1994). "**[T]he absence of such a suggestion to combine is dispositive in an obvious determination.**" Gambro Lundia AB v. Baxter Healthcare Corp., 110 F.3d 1573, 1578-79, 42 USPQ2d 1378, 1383, 1384 (Fed. Cir. 1997) (Emphasis supplied)

Finally, it is impermissible to first ascertain factually what the inventor did and then view the prior art in such a manner as to select from the random facts of that art only those which may be

modified and then utilized to reconstruct the invention from such prior art. Panduit Corp. v. Dennison Manufacturing Co., 774 F.2d 1082, 1092, 227 USPQ 337, 343 (Fed. Cir. 1985).

> A critical step in analyzing the patentability of claims pursuant to section 103(a) is casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field. See Dembiczak, 175 F.3d at 999, 50 USPQ2d at 1617. Close adherence to this methodology is especially important in cases where the very ease with which the invention can be understood may prompt one "to fall victim to the insidious effect of a hindsight syndrome wherein that which only the invention taught is used against its teacher." Id. (quoting W.L. Gore & Assocs., Inc. v. Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 313 (Fed. Cir. 1983)). In Re Werner Kotzab, 217 F.3d 1365, 1369, 55 USPQ2d 1313, 1316 (Fed. Cir. 2000).

Claims 1-7 Are Allowable
Over the Cited References

In rejecting claims 1-7 for obviousness under 35 U.S.C. § 103(a) the Examiner's Action combines:

1. a reference that discloses a pixel-based method for adaptively encoding a sequence of video frames ("the Gormish, et al. patent"); with
2. a reference that discloses an apparatus and method for buffering motion video data in a decoder ("the Bowater, et al. patent); and
3. a reference that discloses a method for preprocessing packets of packetized, encoded, audio and video sequences that eliminates video artifacts and avoids having to

reset a decoder when sequentially decoding a sequence of two different programs ("the Davis, et al. patent").

In explaining application of the combined references to pending claims 1-7, the Examiner's Action dated June 8, 2001, confusingly states regarding the Gormish, et al. patent that:

1. "Gormish et al. discloses a data compression for palettized video images as shown in Figures 1-3, and substantially the same method for producing a compressed video bitstream . . . ;"[29]

2. "**is being relied upon for the claimed feature of 'decoding of the compressed video bitstream produces frames of video which produces image that do not appear to pulse visually'**;"[30] and

3. "the decoder of Gormish et al. provides substantially the same if not the same decoding of the compressed video bitstream producing frames of video which produces image that do not appear to pulse visually as claimed."[31]

Decompressor 122

If the second and third of the preceding quotations from the Examiner's Action correctly characterizes application of the

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[29] Page 2 of the Examiner's Action dated June 8, 2001, last 2 lines.

[30] Page 6 of the Examiner's Action dated June 8, 2001, 5th and 6th lines from the bottom.

[31] Page 6 of the Examiner's Action dated June 8, 2001, last line and top 2 lines of page 7.

Gormish, et al. patent to pending claims 1-7, this argument refuting the rejection of those claims under 35 U.S.C. § 103(a) need proceed little further.

The claimed invention is a method for "producing compressed video data for a plurality of frames" which, upon being decoded by any MPEG compatible decoder, "produces frames of video which produce images that do not pulse visually."[32] Thus, if the Gormish, et al. patent "is being relied upon for the claimed feature of 'decoding of the compressed video bitstream produces frames of video which produces image that do not appear to pulse visually'," and for "the decoder of Gormish et al. [providing] substantially the same if not the same decoding of the compressed video bitstream producing frames of video which produces image that do not appear to pulse visually as claimed," **that reference necessarily fails to disclose or to suggest the claimed invention**, i.e. "producing a compressed video bitstream," and therefore claims 1-7 traverse rejection for obviousness under 35 U.S.C. § 103(a).

If the failure of the decoder (decompressor 122) disclosed in the Gormish, et al. patent and/or in the Bowater, et al. patent to disclose or to suggest the "producing a compressed video bitstream"

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[32] Appellant respectfully submits that it is significant to consideration of the pending claims that the various MPEG specifications, while expressly including in at lest some instances a model, i.e. definition, for a decoder, all omit any model, i.e. definition, for an encoder. That is, the various MPEG standards do not expressly disclose, nor do they even expressly suggest, any apparatus for or method for encoding, i.e. producing, a compressed video bitstream that conforms to the standard.

invention encompassed by claims 1-7 might somehow be perceived as being insufficient to traverse rejection of those claims under 35 U.S.C. § 103(a), then the admitted failure of the Gormish, et al. and/or the Bowater, et al. patents to expressly disclose or to suggest "visual pulsing" of images irrefutably establishes the non-obviousness of claims 1-7 under controlling legal precedent.

Because the Gormish, et al. and/or the Bowater, et al. patents fail to expressly disclose or to suggest "visual pulsing" of images, the rejection of claims 1-7 under 35 U.S.C. § 103(a) set forth in the Examiner's Action dated June 8, 2001, must necessarily rely upon **inherent operation** of the decoder (decompressor 122) depicted in FIG. 3 of the Gormish, et al. patent and/or the AMII card 125 depicted in FIG. 2 of the Bowater, et al. patent, that are described respectively in those references' texts associated with those FIGs. "The mere fact that a certain thing may result from a given set of circumstances in not sufficient" for inherency. Ex parte Skinner, 2 USPQ2d 1788, 1789 (Bd. Pat. App. & Int. 1986). If a claimed invention is not clearly anticipated by a reference, i.e. if the invention is not fully disclosed in a single prior art reference or embodied in a single practice or device, arguments of inherency are immaterial[33]. Jones et al. v. Hardy, 727 F.2d 1529-30, 220 USPQ 1021, 1025-26 (Fed. Cir. 1984). Inherency . . . may not be established by probabilities or possibilities.

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[33] For example in a rejection of claims under 35 U.S.C. § 103(a).

"'That which may be inherent is not necessarily known. Obviousness cannot be predicated on what is unknown.'" In re Newell, 891 F.2d 899, 901, 13 USPQ2d 1248, 1250 (Fed. Cir. 1989). Thus, as a matter of law, a combination of the decoders (decompressor 122) disclosed in the Gormish, et al. and/or the Bowater, et al. patents cannot render claims 1-7 obvious under 35 U.S.C. § 103(a) based upon their inherent operation, and the Appellant respectfully requests that the rejection of claims 1-7 be immediately withdrawn, and those claims pass immediately to issue.

Compressor 108

If for some reason the second and third quotations from the June 8, 2001, Examiner's Action set forth above do not accurately state the rationale upon which the Gormish, et al. patent is being applied in rejecting claims 1-7 for obviousness under 35 U.S.C. § 103(a), and that reference is, in fact, being utilized for the compressor illustrated there in FIGs. 1, 2 and 4, then and only then need the Appellant present further arguments establishing that claims 1-7 are allowable over the combined references of the Gormish, et al., Bowater, et al. and Davis, et al. patents.

In characterizing in greater detail than that set forth above the disclosure of the Gormish, et al. patent, the June 8, 2001, Examiner's Action states, in the text beginning with the last two lines on page 2 of the Examiner's Action and continuing through the remainder of the paragraph top 2 lines of page 3:

1. "Gormish et al. discloses a data compression for palettized video images as shown in Figures 1-3, and substantially the same method for producing a compressed video bitstream that includes compressed video data for a plurality of frames from data that specifies a single still image as claimed in claims 1 and 4, comprising";
2. "substantially the same fetching the data for the still image (i.e., 104 of Figure 1);"
3. "encoding data for the still image into data for an intra frame (i.e., [compressor] 108 of Figure 1 and see column 4, lines 49-65);"
4. "storing the encoded I frame data (i.e., [frame store] 204C of Figure 2);"
5. "assembling the compressed video bitstream by appropriately combining data for at least a single copy of the stored I frame (see Figure 2);" and
6. "whereby decoding of the compressed video bitstream produces frames of video that do not appear to pulse visually (see [decompressor] 122 of Figure 1 and Figure 3).

Initially Appellant makes two observations regarding the preceding characterization of the Gormish, et al. patent.

1. Item 6 of the characterization reinforce the position in the already discredited second and third quotations set

forth above from the June 8, 2001, Examiner's Action regarding the decoder (decompressor 122).

2. The entire one paragraph characterization quoted above includes only a single citation to a sixteen (16) line, contiguous segment of text in the Gormish, et al. patent, i.e. column 4, lines 49-65.

The Appellant respectfully submits that the Examiner's Action avoidance of more extensive citation of texts in the Gormish, et al. patent in support of the rejection of claims 1-7 is puzzling if the Gormish, et al. patent truly uses, as alleged, "substantially the same method for producing a compressed video bitstream that includes compressed video data for a plurality of frames from data that specifies a single still image." **Why would the Examiner's action omit citations to the text regarding the illustrations of FIGs. 1-3 of the Gormish, et al. patent if those texts would actually support the rejection of the claims**?

The extensive texts quoted above from the Gormish, et al. patent regarding the illustrations of FIGs. 1-4, 6 and 7 and the texts of the reference set forth in Exhibit A absolutely refute the preceding characterizations quoted above from the Examiner's Action. Rather, texts from the Gormish, et al. patent:

1. at best disclose fetching a sequence of image frames of a still image 104:

   a. in FIG. 1; and

b. in the text in col. 4 at lines 51-58 describing FIG. 1;

2. disclose the compressor 108 of FIG. 1 moves data for the sequence of image frames of the still image present in the original file 200 through a context modeller 202C, and an entropy coder 208C to form compressed file 220[34] representing a compressed version of original file 200[35];

3. discloses storing into the frame store 204C in FIG. 2 unencoded pixel values used subsequently for context comparisons, and **not encoded I frame data as alleged in the Examiner's Action**[36]; and

4. because **an I frame is not stored in the frame store 204C**, cannot disclose assembling the compressed video bitstream by appropriately combining data for at least a single copy of the I frame which the Examiner's Action dated June 8, 2001, falsely alleges is stored into the frame store 204C.

For the preceding reasons, if the Examiner's Action were to attempt combining the compressor illustrated in FIGs. 1, 2 and 4 of the Gormish, et al. patent with the disclosures of the two other

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[34] The Gormish, et al. patent col. 5, line 66 - col 6, line 1.

[35] The Gormish, et al. patent col. 5, lines 60-61.

[36] The Gormish, et al. patent col. 6, lines 17-19.

references for rejecting claims 1-7 for obviousness under 35 U.S.C. § 103(a), that attempt is doomed to fail.

For these reasons, the Appellant respectfully submits that the paragraph quoted above from pages 2 and 3 of the Examiner's Action truly constitutes nothing more than an artful hindsight reconstruction of the invention which, unfettered by expressly contradictory texts that appear in the Gormish, et al. patent, reads most of the text of pending claim 1 onto the illustrations of FIGs. 1-3 in that reference. The Appellant furthermore respectfully submits that this artful hindsight reconstruction is only possible if one completely ignores texts in the Gormish, et al. patent describing the illustrations of FIGs. 1-3. Moreover, even use of the artful hindsight reconstruction fails to render claims 1-7 obvious under 35 U.S.C. § 103(a) because none of the three references cited in the Examiner's Action discloses or suggests:

1. the reconstruction; or
2. that the reconstruction combined with the other two references would lead one of ordinary skill in the art to the solution of the problem encompassed by pending claims 1-7.

Rebuttal of Examiner's Action Arguments

The Examiner's Action dated June 8, 2001, criticizes arguments which the Appellant presented in a April 10, 2001, response to a

prior Examiner's Action. Relying upon case authority, the June 8, 2001, Examiner's Action at the bottom of page 5 argues that:

1. "[o]ne of ordinary skill in the art is presumed to possess a certain amount of background knowledge independent of the references;" and
2. "[t]he conclusion of obviousness may be made from common knowledge and common sense of a person of ordinary skill in the art without any specific hint or suggestion in a particular reference."

The first full paragraph on page 6 the June 8, 2001, Examiner's Action, again with a citation to case authority, criticizes the Appellant's response to rejection of claims based upon obviousness for attempting to "show nonobviousness by attacking references individually where, as here the rejections are based on combination of references." The cases citedin the Examiner's Action dated June 8, 2001, hold that one of ordinary skill in the art is presumed to possess skill rather than stupidity, In Re Sovish, 769 F.2d, 738, 743, 226 USPQ 771, 774. (Fed.Cir. 1985);. A subsequent decision that cites In Re Sovish states:

> [t]aking into account the appropriate level of skill in the art, we presume that a person having ordinary skill would exercise **common sense and sound judgment**. Ex parte Beck, 9 USPQ2d 1995, 2002. (Bd. Pat. App. & Int'f 1987) (Emphasis supplied.)

While the case authority of In re Bozek, 416 F.2d 1385, 1390, 163 USPQ 545, 549 (C.C.P.A. 1969), supports the proposition that:

> [t]he conclusion of obviousness may be made from common knowledge and common sense of a person of ordinary skill

> in the art without any specific hint or suggestion in a particular reference,

subsequent Federal Circuit decisions have limited the application of common knowledge and common sense in rejecting claims for obviousness under 35 U.S.C. § 103(a). For example, Smiths Industries Medical Systems v. Vital Signs, 183 F.3d 1347, 1356, 51 USPQ2d 1415, 1421 (Fed.Cir. 1999), which cites In re Bozek, holds:

> [t]hat knowledge may have been within the province of the ordinary artisan does not in and of itself make it so, absent clear and convincing evidence of such knowledge. (Emphasis in the original.)

Consequently, Smith Industries holds that in rejecting claims for obviousness under 35 U.S.C. § 103(a) one cannot speculate about the common knowledge and common sense of the ordinary artisan. Smith Industries further holds that, as in the present application, if references lack any specific hint or suggestion that they be combined, the references may be combined to obtain the claimed invention, only after establishing the common knowledge and common sense of the ordinary artisan. Thus, a naked assertion about the common knowledge and common sense of the ordinary artisan, as set forth in the Examiner's Action dated June 8, 2001, is insufficient, by itself, under Smith Industries, supra, to permit combining references.

Lastly, the June 8, 2001, Examiner's Action relying upon legal authority correctly observes that it is improper to "show nonobviousness by attacking references individually where, as here, the rejection is based on combination of references." In re

Keller, 642 F.2d 413, 426, 208 USPQ 871, 882 (CCPA 1981) Analogously, as pointed out above, in deciding obviousness one must also consider the claim as a whole, Litton Industrial, supra, and the prior art as a whole must be considered, and those portions of the prior art arguing against or teaching away from the claimed invention must be considered, Bausch & Lomb, Inc., supra. However, in considering both the claims as a whole and the prior art as a whole, the Federal Circuit requires both:

1. analyzing the prior art to identify there the source of various claim limitations in that art, and
2. a motivation, teaching or suggestion to combine those claim limitations. Smith Industries, supra.

Exhibit D to this Appeal Brief is a table containing the text of twice amended independent claim 1 juxtaposed with citations to locations as which various claim limitations appear in the Gormish, et al., the Bowater, et al. and the Davis, et al. patents. As such, Exhibit D compares the text of claim 1 as a whole with the disclosures of the three references taken as a whole.

It is readily apparent from Exhibit D that none of the references, either alone or in combination, discloses:

1. producing a compressed video bitstream that includes compressed video data for a plurality of frames from data that specifies a single still image, i.e. the invention;
2. fetching the data for the single still image;

3. encoding the data for the still image into data for an I frame; or

4. storing the encoded I frame data.

Citing In re Keller, the Federal Circuit recently held In re Kotzab, supra, that:

> [t]he test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art. See In re Keller, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981) (and cases cited therein). **Whether the Board relies on an express or an implicit showing, it must provide particular findings related thereto.** See Dembiczak, 175 F.3d at 999, 50 USPQ2d at 1617. **Broad conclusory statements standing alone are not "evidence."** Kotzab, at 1369, 1316. (Emphasis supplied.)

Where, as in the present rejection of claims 1-7 for obviousness under 35 U.S.C. § 103(a) based upon a combination of the Gormish, et al, the Bowater, et al. and the Davis, et al. patents, the text of the Gormish, et al. patent expressly contradicts the rational for rejecting those claims presented in the June 8, 2001, Examiner's Action[37], the rejection of pending claims 1-7 necessarily lacks even credible broad conclusory statements that the Federal Circuit expressly prohibited In re Kotzab, id.

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[37] For example, the allegation on page 3 of the Examiner's Action dated June 8, 2001, that the frame store 204C in the Gormish, et al. patent stores "the encoded I frame data (i.e., [frame store] 204C of Figure 2)" when the text of the reference, in fact, expressly discloses both in col. 6 at lines 16-19 and in col. 7 at lines 17-19 that the frame store 204C receives only unencoded pixel values. The Gormish, et al. patent in col.12 at lines 14-20 similarly expressly discloses that the frame store 204D of the decompressor 122 receives only unencoded pixel values.

What Combining The Three References Truly Discloses

Forgetting entirely the disclosure of the present application, what does a combination of the Gormish, et al., Bowater, et al. and Davis, et al. patents, taken as a whole, suggest to one of ordinary skill in the art about producing, that is not decoding, a compressed video bitstream that includes compressed video data for a plurality of frames?

Clearly, the Gormish, et al. patent discloses that a compressor 108 (encoder) can encode a sequence of still image frames into a sequence of compressed video frames. If compression of the sequence of still image frames were performed in accordance with the MPEG standard disclosed in the Davis, et al. patent, and if the encoded sequence of compressed video frames were decoded using an MPEG decompressor 122 (decoder) similar to that disclosed in the Gormish, et al. patent, then images produced from the decoded compressed video frames will surely appear to pulse visually, usually at a frequency identical to the frequency at which GOPs occur in the MPEG compressed video bitstream, e.g. twice per second.

If a network were interposed between the compressor 108 (encoder) disclosed in the Gormish, et al. patent and the decompressor 122 (decoder), then images produced from the decoded compressed video frames will undoubtedly continue appearing to pulse visually. If the network interposed between the compressor 108 and the decompressor 122 were an asynchronous or non-ideal

network, and if the asynchronous network were at times unable to supply the decompressor 122 with sufficient compressed video data, then in according with the disclosure of the Bowater, et al. patent:

> after transmission across the asynchronous or non-ideal network, . . . frames [of compressed video data] arrive at [the decompressor 108 at] irregular intervals. Some frames arrive early, some are delayed, and bunching can occur.
>
> * * *
>
> In such [a system] it [would be] necessary to match the irregular arrival of frames over the network with the constant supply required to the output screen. (Col. 1, lines 40-49)

Having access to the Bowater et al. patent, one of ordinary skill in the art would understand that, in accordance with the invention disclosed in that reference, the requirement that an MPEG implementation of the Gormish, et al. decompressor 108 receive frames of compressed video data at a constant rate despite delays introduced by the asynchronous or non-ideal network could be satisfied if:

1. MPEG null frames were added to the compressed video data during intervals in which the network supplied an insufficient amount of video data; and
2. thereafter, the decompressor 122 (decoder) deletes frames of compressed video data which arrived late.

Thus, taken as a whole the Gormish, et al., Bowater, et al. and Davis, et al. patents do not disclose nor do they suggest to one of ordinary skill in the art any solution to the problem of still frame video images that appears to pulse visually. Further-

more, as Appellant has observed above, at a more fundamental level the combined references fail to disclose or to suggest express limitations that appear in the text of independent claim 1. Therefore, the Examiner's Action dated June 8, 2001, improperly rejects claim 1 under 35 U.S.C. § 103(a) for obviousness, and the rejection of independent claim 1, together with the rejection for obviousness of claims 2-7 which depend from claim 1, must be overruled.

Claim 4 Is Allowable
Over the Cited References

Claim 4 depends from independent claim 1 and further restricts the claimed invention to a method for producing a compressed video bitstream in which:

> parameters employed in encoding the data for the still image produce an amount of data for the I frame that approaches, but remains less than, storage capacity of a buffer memory included in a decoder that stores the compressed video bitstream.

The Examiner's Action dated June 8, 2001, couples the rejection of dependent claim 4 with the rejection of independent claim 1 alleging:

> wherein parameters employed in encoding the data for the still image produce an amount of data for the I frame that approaches, but remains less than, storage capacity of a buffer memory included in a decoder that stores the compressed video bitstream (see 204D of Figure 3).[38]

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[38] Page 3 of the Examiner's Action dated June 8, 2001, last 3 lines at the end of the first paragraph.

As set forth above in the summarization of the Gormish, et al. patent's disclosure, that reference discloses only that the frame store 204D merely stores pixels received from the context modeller 202D of the decompressor 122, and supplies pixels to the context modeller 202D[39].

Despite a diligent search through all three references cited in the Examiner's Action dated June 8, 2001, which rejects dependent claim 4 under 35 U.S.C. § 103(a) for obviousness, Appellant is unable to find any disclosure in any of those references of encoding a frame of a video signal so the data for an I frame "approaches, but remains less than, storage capacity of a buffer memory included in a decoder that stores the compressed video bitstream."

Since none of the references cited in the Examiner's Action dated June 8, 2001, disclose encoding a video signal so the data for an I frame "approaches, but remains less than, storage capacity of a buffer memory included in a decoder that stores the compressed video bitstream," the Examiner's Action dated June 8, 2001, improperly rejects claim 4 under 35 U.S.C. § 103(a) for obvious-ness, and that rejection must be overruled.

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[39] The Gormish, et al. patent col. 12, lines 14-20.

Claim 5 Is Allowable
Over the Cited References

Claim 5 depends from independent claim 1 and further restricts the claimed invention to a method for producing a compressed video bitstream in which:

> null frames assembled into the compressed video bitstream also include bitstream stuffing whereby the compressed video bitstream is transmittable at a pre-established bitrate.

The Examiner's Action dated June 8, 2001, acknowledges that the Gormish, et al. patent fails to disclose bitstream stuffing.[40] To overcome this omission the Examiner's Action states:

> Davis et al discloses a method and device for preprocessing streams of encoded data to facilitate decoding streams back to back as shown in Figures 2, 3A, 3B, 5, and 6, and teaches the conventional MPEG-1 and MPEG-2 standard decodings (see column 1), assembling the compressed video bitstream by appropriately combining data for headers such as sequence header, group start code, picture start code, sequence end code, picture header, and picture coding extension (see column 3, line 41 to column 4, line 16), as well as **bitstream stuffings** whereby the compressed video bitstream may be transmitted at a preestablished bitrate (see Figure 2)..[41]

FIG. 2 of the Davis, et al. patent "illustrates the syntax of a [packetized elementary stream] (]PES[)] packet 200.[42]"

> A "packetized elementary stream" (or PES) packet is a[n MPEG II] data structure used to carry "elementary stream data". An "elementary stream" is a generic term for one of (a) coded video, (b) coded audio, or (c) other coded

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[40] Page 3 of the Examiner's Action dated June 8, 2001, 4th through 9th lines from the bottom of the page.

[41] Page 4 of the Examiner's Action dated June 8, 2001, 3rd through 8th lines in the final paragraph.

[42] The Davis, et al. patent col. 3, lines 14-15.

> bit streams carried in a sequence of PES packets with one and only stream ID.[43]

While FIG. 2 of the Davis, et al. patent depicts "stuffing bytes (0xFF)," Appellant is unable to find in that reference any text which further describes the illustrated "stuffing bytes (0xFF)."

FIG. 1 of the Davis, et al. patent illustrates the syntax of an MPEG II transport stream, and of an MPEG II transport stream packet. Similar to FIG. 2 of the Davis, et al. patent, FIG. 1 also depicts stuffing bytes 136, and in col. 2 at line 44 mentions them. However, despite a diligent search of the text of the Davis, et al patent, Appellant is unable to find any further disclosure regarding the stuffing bytes 136 depicted in FIG. 2.

Regarding bitrate, the Davis, et al. patent, in col. 11, line 61 through col. 12, line 5, explains that:

> [t]he bit rate field [in the MPEG II sets a constant bit rate at which the transport stream (including audio PES streams, video PES streams, and program specific information (or "PSI") data) should be fed to a playback card 810. **The value of the bit rate field can be based on (i) the frame rate at which the video is to be displayed, (ii) the file size, and (iii) the frame count.** The frame rate is derived from a standard, such as the NTSC (or National Television Standards Committee) for example. The file size is determined by means of a system call by the preprocessor 922. The frame count is determined based on the number of picture headers 312 in the video sequence. (Emphasis supplied.)

Appellant is unable to find in the Davis, et al. patent, or in either of the other two (2) cited references, any disclosure, or suggestion, that bitstream stuffing, e.g. stuffing bytes (0xFF) or

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[43] The Davis, et al. patent col. 1, lines 49-54.

stuffing bytes 136 in the Davis, et al. patent, be added to the compressed video bitstream so the compressed video bitstream is transmittable at a pre-established bitrate. Therefore, Appellant is unable to find, as expressly required by the text of dependent claim 5, in any of the cited references a disclosure that bitstream stuffing be included in null frames so the compressed video bitstream is transmittable at a pre-established bitrate.

Since none of the references cited in the Examiner's Action dated June 8, 2001, disclose including bitstream stuffing in null frames so the compressed video bitstream is transmittable at a pre-established bitrate, the Examiner's Action dated June 8, 2001, improperly rejects claim 5 under 35 U.S.C. § 103(a) for obviousness, and that rejection must be overruled.

Claims 2 and 3 Are Allowably Definite

The Examiner's Action dated June 8, 2001, maintains a rejection of claims 2 and 3 set forth in an Examiner's Action dated December 6, 2000, Paper No. 2, for being indefinite under 35 U.S.C. § 112, second paragraph. Claim 2 requires that:

> the assembled compressed video bitstream is decodable in accordance with the MPEG-1 standard . . .

Claim 3 requires that:

> the assembled compressed video bitstream is decodable in accordance with the MPEG-2 standard . . .

In maintaining the rejection of claims 2 and 3, the Examiner's Action dated June 8, 2001, states:

> the time frame between when the invention was reduced to practice till the time the application is filed, for example, there could be various versions of the recommendations. And unless the versions and dates of the recommendations are provided, the metes and bounds of the claimed limitations are not clearly set forth, and thus renders the claims indefinite.

The Examiner's Action dated December 6, 2000, in initially rejecting claims 2 and 3 for being indefinite under 35 U.S.C. § 112, second paragraph, states:

> claim 2, line 3, wherein the claim claims the "MPEG-1" recommendation is indefinite because there are many versions of the MPEG-1 recommendations and the recommends are continuously updated. The scope of the claim limitations cannot change over time, and unless the specification states a specific MPEG-1 version and date or a copy of the MPEG-1 recommendation is provided, the claim is indefinite;
>
> * * *
>
> claim 3, line 3, wherein the claim claims the "MPEG-2" recommendation is indefinite because there are many versions of the MPEG-2 recommendations and the recommends are continuously updated. The scope of the claim limitations cannot change over time, and unless the specification states a specific MPEG-2 version and date or a copy of the MPEG-2 recommendation is provided, the claim is indefinite . . . .

First, it appears that the issue of the "Risk of the Future" which underlies the preceding rejection frequently arises in the context of claim rejections for lack of enablement rather than for claim indefiniteness. See Chisum § 7.03[3][c] and In re Metcalfe, 410 F.2d 1378, 161 USPQ 789 (CCPA 1969). In re Metcalfe holds that insufficiency of disclosure rejections due to "Risk of the Future" are to be decided on a case-by-case basis using a rule of reason analysis. Id. at 1382, 792. In re Metcalfe observes that there always exist a "possibility," however remote, that at some future

date a material or an apparatus might no longer be available for practicing a patented invention, but that the existence of such a risk should not bar the issuance of a patent in every instance.

In *Ex parte* Saceman, 27 USPQ2d 1472, 1474 (Bd. Pat. App. & Int'f 1993), the Board of Appeals, following the holding of In re Metcalfe, held that "Risk of the Future" indefiniteness of claim terms must also be decided using a rule of reason analysis applied to the facts of the case. In *Ex parte* Logan, 20 USPQ2d 1465, 1469-70 (Bd. Pat. App. & Int'f 1991), the Board of Appeals held that a patent should issue on an application having a specification which used "pseudo-code", metaphors and relative terminology to describe a computer-implemented patient inspiration detection method.

In the present application, the two Examiner's Action rejections of claims 2 and 3 quoted above allege that the claims will become indefinite "because there are many versions of the MPEG-X recommendations and the recommends are continuously updated." Appellant observes that the various versions of the MPEG-[X] specification have all been published by the International Organization for Standardization ("ISO") and/or International Electrotechnical Commission ("IEC"). Thus, the use of metaphors and relative terminology, respectively MPEG-1 and MPEG-2 in claims 2 and 3 that Board of Appeals approved for computer related inventions in In *Ex parte* Logan, is reasonable for pending claims 2 and 3 because there exist little likelihood that ISO's and/or

IEC's publications of the MPEG-1 and MPEG-2 specifications will become unavailable during the term of a patent issuing on the present application.

Conclusion

The evidence cited throughout this voluminous Appeal Brief, particularly as summarized in Exhibit D which compares the text of twice amended independent claim 1 with the pertinent disclosures in the Gormish, et al., the Bowater, et al. and the Davis, et al. patents, irrefutably establishes that even a combination of the disclosures in the three references, taken as a whole, fails to render obvious under 35 U.S.C. § 103(a) the present invention encompassed by claim 1, taken as a whole. The combined references fail to render independent claim 1 obvious for various reasons summarized in Exhibit D. Those reasons include the combined references omitting essential elements of independent claim 1.[44] Furthermore, even if contrary to fact the combined references were to render independent claim 1 obvious, for the reasons expressly set forth above, the combined references do not render dependent claims 4 and 5 obvious under 35 U.S.C. § 103(a). For all the preceding reasons, the Examiner's Action's rejection of pending claims 1-7 for obviousness under 35 U.S.C. § 103(a) must be overruled.

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[44] E.g., "storing the encoded I frame data . . . "

Appellant further observes that since all three references lack any suggestion that they be combined to address the problem solved by the present invention,[45] there exists no motivation, except for the claims of the present application, for combining the references. Therefore, combining the references to reject any of the claims pending in the present application for obviousness under 35 U.S.C. § 103(a) is improper. Thus, for this second reason the Examiner's Action's rejection of pending claims 1-7 must be overruled.

Lastly, because there exists no basis except the pending claims for combining the references, and because the references when combined fail to disclose the present invention as embodied in the pending claims, it is readily apparent that the rejection of claims 1-7 under 35 U.S.C. § 103(a) for obviousness as set forth in the Examiner's Action dated June 8, 2001, is a canard. As set forth above, there exist no motivation, either explicitly or implicitly, in the cited references themselves suggesting that they be combined for the purpose of the present invention. Rather, any motivation to combine the disclosures of the three (3) references appears only in the texts of claims pending in this application. Thus, the rejection of the pending claims truly relies only upon an unpermitted artful hindsight reconstruction of the invention which first ascertains factually what the inventor did and then views the

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[45] I.e., images that appears to pulse visually that result from decoding a conventionally encoded MPEG compressed video bitstream of a still image.

prior art in such a manner as to select from the random facts of that art only those which may apparently be modified and then utilized to reconstruct the invention from such prior art. Panduit supra. Therefore, for this third reason the Examiner's Action's rejection of pending claims 1-7 for obviousness under 35 U.S.C. § 103(a) must be overruled.

Finally, for the reasons set forth above, the rejection of dependent claims under 35 U.S.C. § 112, second paragraph, must also be overruled because there exists no reasonable likelihood that claims 2 and 3 could become indefinite during the term of any patent issuing on the present application.

Respectfully submitted

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APPENDIX I
CLAIMS

1. A method for producing a compressed video bitstream that includes compressed video data for a plurality of frames from data that specifies a single still image, the method comprising the steps of:

fetching the data for the still image;

encoding the data for the single still image into data for an I frame;

storing the encoded I frame data; and

assembling the compressed video bitstream by appropriately combining data for:

at least a single copy of the stored I frame;

at least one null frame; and

various headers required for decodability of the compressed video bitstream;

whereby decoding of the compressed video bitstream produces frames of video which produce images that do not appear to pulse visually.

2. The method of claim 1 wherein:

the assembled compressed video bitstream is decodable in accordance with the MPEG-1 standard; and

the various headers assembled into the compressed video bitstream include:

a sequence_header beginning the compressed video bitstream;

at a beginning of group of pictures, a group_start_code;

for each encoded frame, a picture_start_code; and

a sequence_end_code ending the compressed video bitstream.

3. The method of claim 1 wherein:

the assembled compressed video bitstream is decodable in accordance with the MPEG-2 standard; and

the various headers assembled into the compressed video bitstream include:

a sequence_header beginning the compressed video bitstream;

for each encoded frame:

a picture_header; and

a picture_coding_extension; and

a sequence_end_code ending the compressed video bitstream.

4. The method of claim 1 wherein parameters employed in encoding the data for the still image produce an amount of data for the I frame that approaches, but remains less than, storage capacity of a buffer memory included in a decoder that stores the compressed video bitstream.

5. The method of claim 1 wherein null frames assembled into the compressed video bitstream also include bitstream stuffing

whereby the compressed video bitstream is transmittable at a pre-established bitrate.

6. The method of claim 1 wherein the various headers assembled into the compressed video bitstream include:

a sequence_header beginning the compressed video bitstream;

at a beginning of group of pictures, a group_start_code;

for each encoded frame, a picture_start_code; and

a sequence_end_code ending the compressed video bitstream.

7. The method of claim 1 wherein the various headers assembled into the compressed video bitstream include:

a sequence_header beginning the compressed video bitstream;

for each encoded frame:

a picture_header; and

a picture_coding_extension; and

a sequence_end_code ending the compressed video bitstream.

US005689589A

United States Patent [19]

Gormish et al.

[11] Patent Number: 5,689,589

[45] Date of Patent: Nov. 18, 1997

[54] **DATA COMPRESSION FOR PALETTIZED VIDEO IMAGES**

[75] Inventors: **Michael J. Gormish**, Los Altos; **Martin P. Boliek**, San Francisco, both of Calif.

[73] Assignees: **Ricoh Company Ltd.**, Tokyo, Japan; **Ricoh Corporation**, Menlo Park, Calif.

[21] Appl. No.: **347,789**

[22] Filed: **Dec. 1, 1994**

[51] **Int. Cl.**[6] **G06K 9/46**; H04N 1/40

[52] **U.S. Cl.** **382/239**; 382/232; 382/236; 382/233; 348/415; 341/107

[58] **Field of Search** 382/236, 232, 382/233, 235, 239, 248, 251, 253; 341/107, 51, 73, 76; 348/416, 415; 358/426

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Primary Examiner—Leo Boudreau
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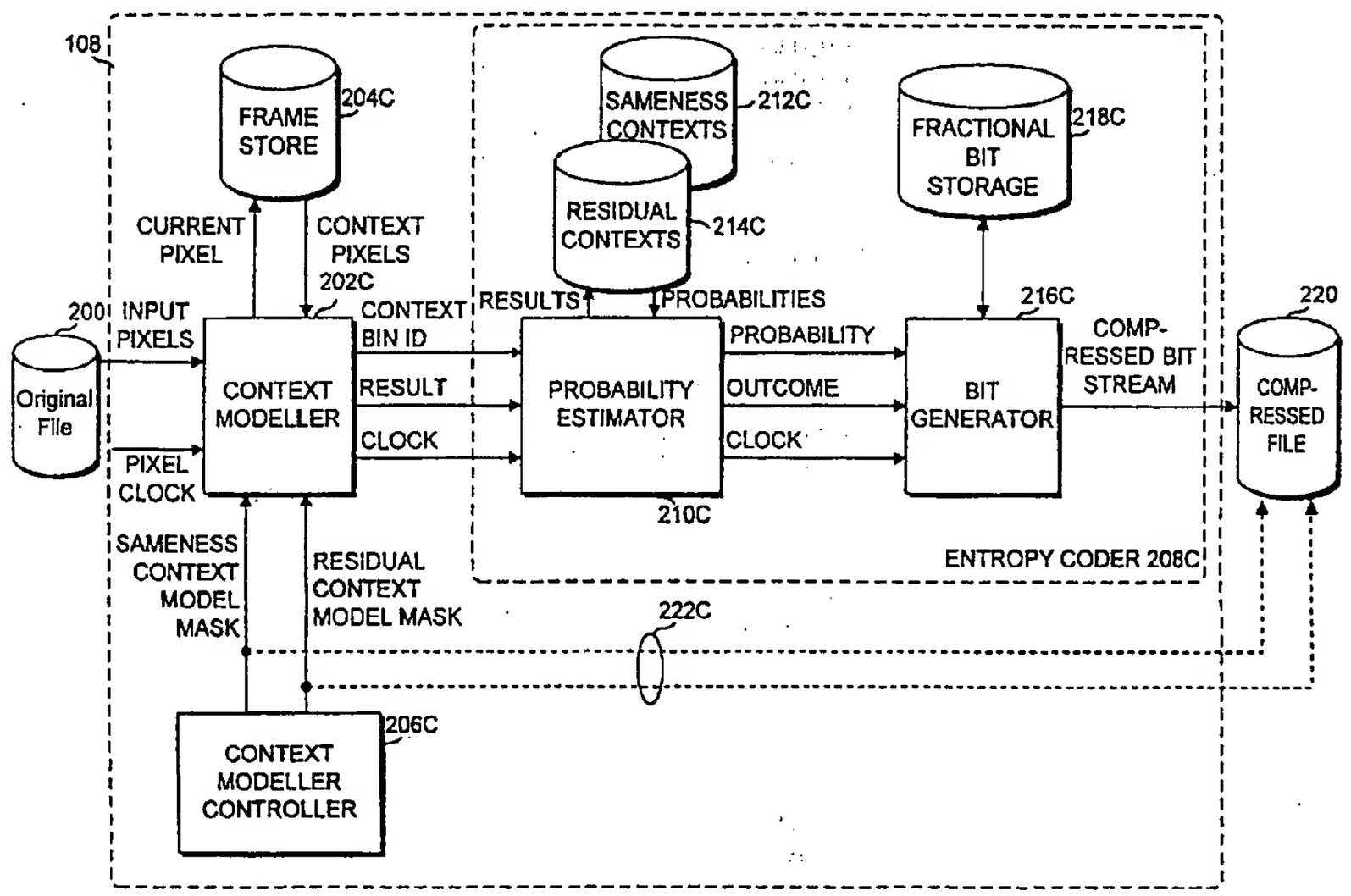
Attorney, Agent, or Firm—Philip H. Albert; Townsend and Townsend and Crew LLP

[57] **ABSTRACT**

A data compression system uses sameness information, such as temporal sameness of corresponding pixels, in the coding process. Two sets of contexts are used, one set when a pixel is the same as a sameness pixel, and one set of contexts for residual coding of the pixel when it is not the same. The use of the sameness bit saves computation because, if in decoding the one "sameness" bit, a decompressor determines that the pixel is equal to the corresponding pixel in a previous frame, then no further decoding is needed for that pixel.

23 Claims, 7 Drawing Sheets



Docket no. 2134 **EXHIBIT A**

EXHIBIT A

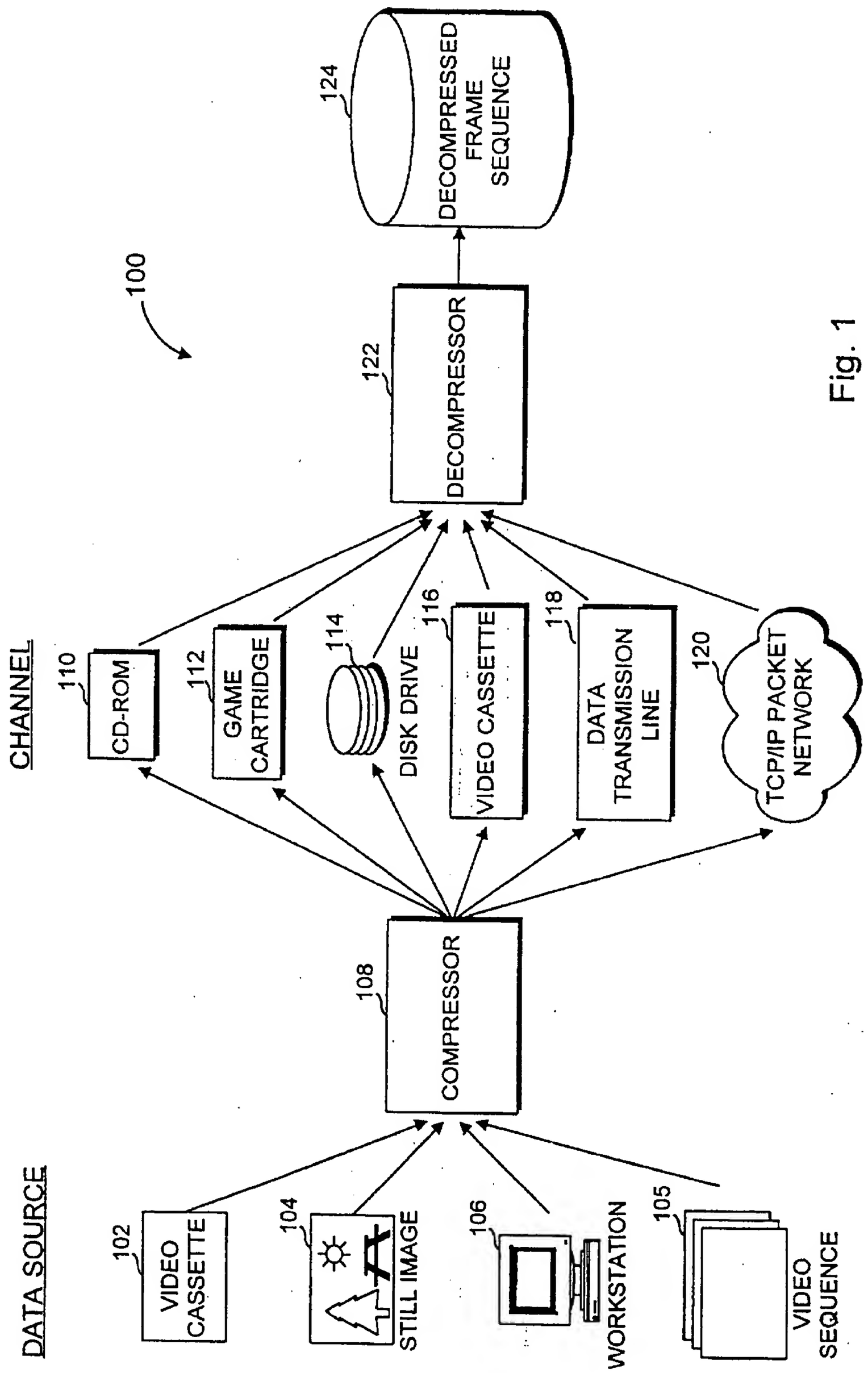


Fig. 1

Docket no. 2134 **EXHIBIT A**

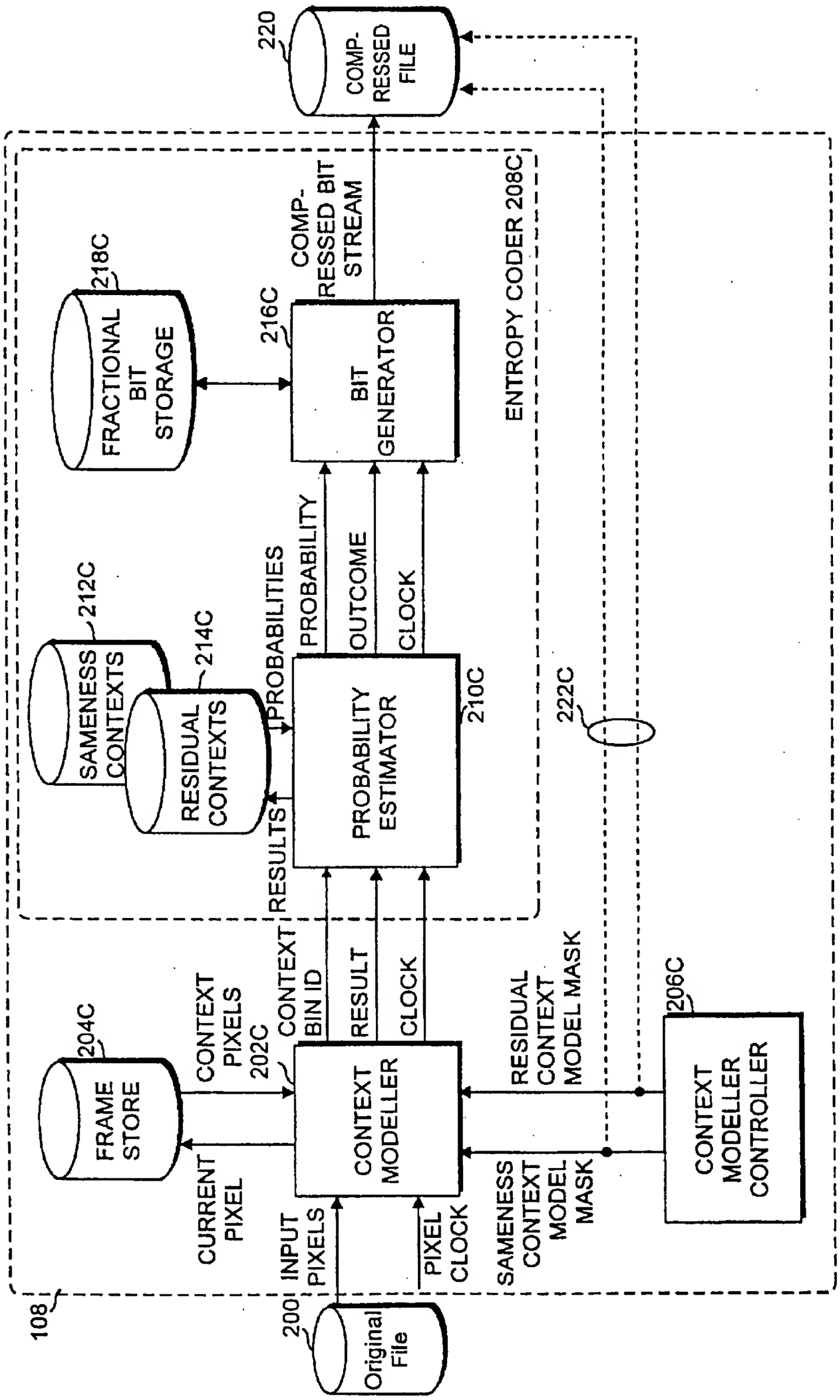

220
COMP-RESSED FILE
ENTROPY CODER 208C
COMP-RESSED BIT STREAM
218C
FRACTIONAL BIT STORAGE
216C
BIT GENERATOR
212C
SAMENESS CONTEXTS
214C
RESIDUAL CONTEXTS
PROBABILITIES
RESULTS
PROBABILITY ESTIMATOR
210C
PROBABILITY
OUTCOME
CLOCK
222C
206C
204C
FRAME STORE
CONTEXT PIXELS
202C
CONTEXT BIN ID
RESULT
CLOCK
CONTEXT MODELLER
RESIDUAL CONTEXT MODEL MASK
CONTEXT MODELLER CONTROLLER
CURRENT PIXEL
INPUT PIXELS
PIXEL CLOCK
SAMENESS CONTEXT MODEL MASK
108
200
Original File

Fig. 2

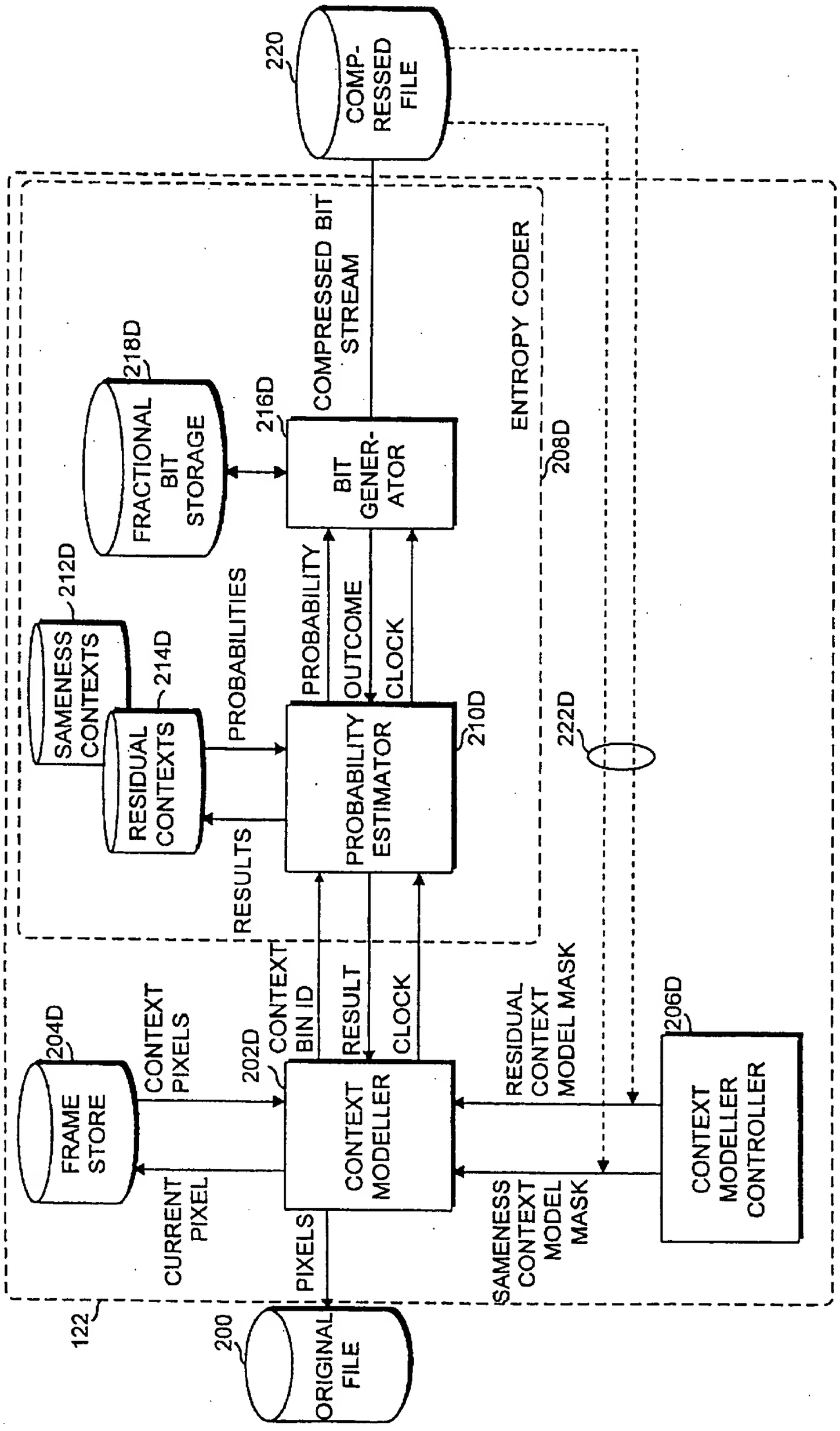

220
COMP-RESSED FILE
COMPRESSED BIT STREAM
ENTROPY CODER
208D
218D
FRACTIONAL BIT STORAGE
216D
BIT GENER-ATOR
212D
SAMENESS CONTEXTS
214D
RESIDUAL CONTEXTS
PROBABILITIES
PROBABILITY
OUTCOME
CLOCK
PROBABILITY ESTIMATOR
210D
222D
RESULTS
204D
FRAME STORE
CONTEXT PIXELS
202D
CONTEXT BIN ID
RESULT
CLOCK
CONTEXT MODELLER
RESIDUAL CONTEXT MODEL MASK
206D
CONTEXT MODELLER CONTROLLER
CURRENT PIXEL
PIXELS
SAMENESS CONTEXT MODEL MASK
122
200
ORIGINAL FILE

Fig. 3

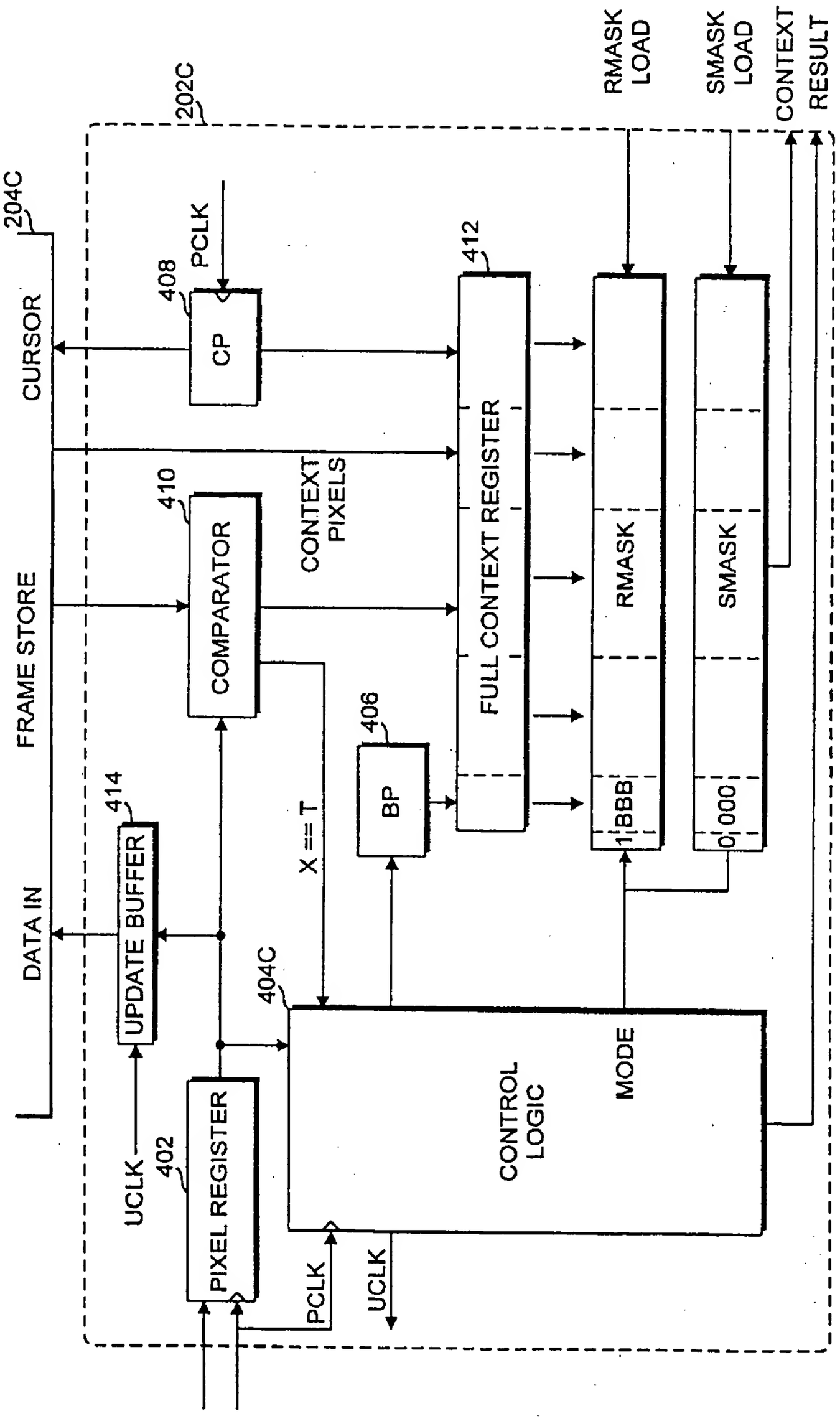


Fig. 4

Docket no. 2134 **EXHIBIT A**

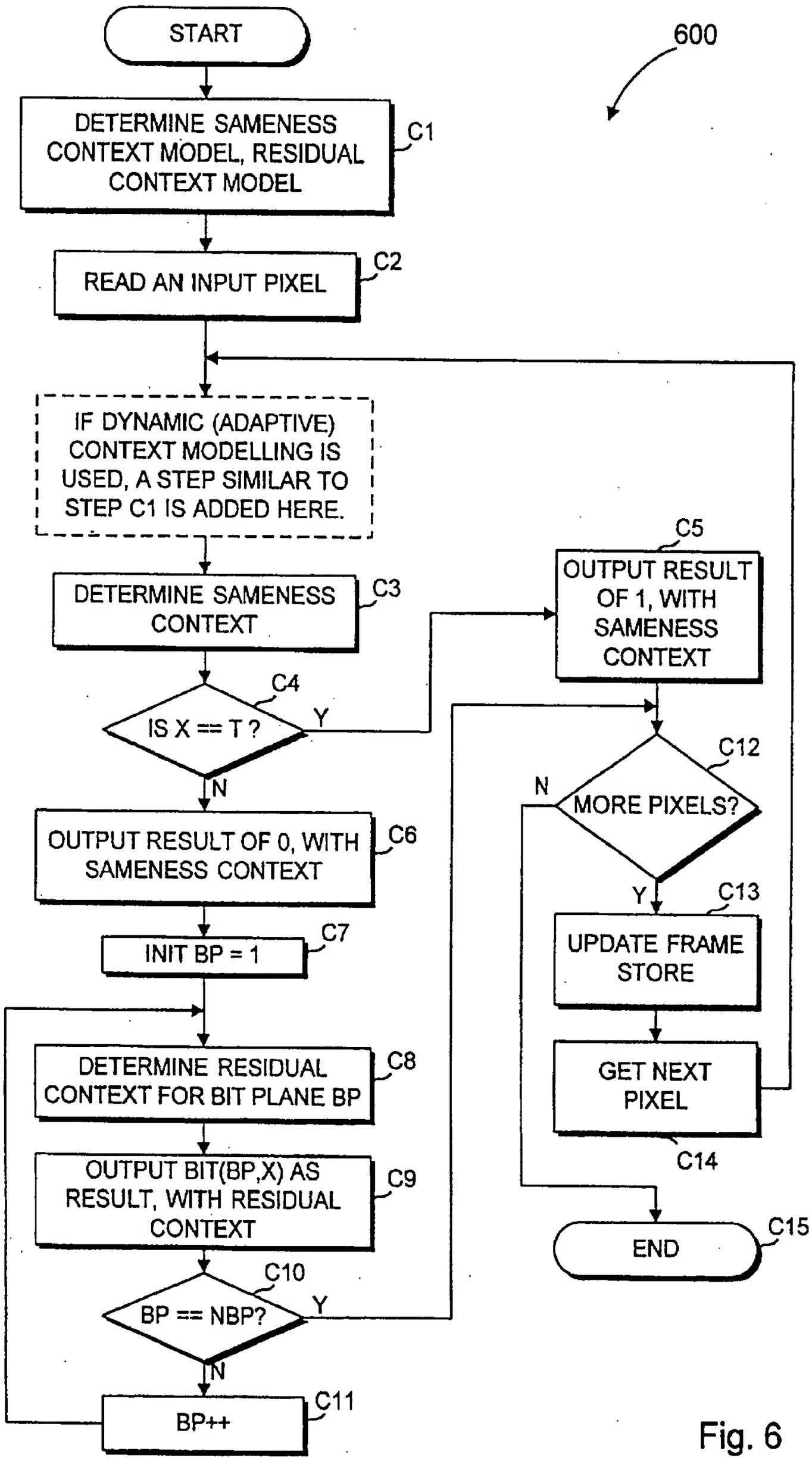

600
START
DETERMINE SAMENESS CONTEXT MODEL, RESIDUAL CONTEXT MODEL
C1
READ AN INPUT PIXEL
C2
IF DYNAMIC (ADAPTIVE) CONTEXT MODELLING IS USED, A STEP SIMILAR TO STEP C1 IS ADDED HERE.
DETERMINE SAMENESS CONTEXT
C3
IS X == T ?
C4
Y
N
OUTPUT RESULT OF 1, WITH SAMENESS CONTEXT
C5
OUTPUT RESULT OF 0, WITH SAMENESS CONTEXT
C6
INIT BP = 1
C7
DETERMINE RESIDUAL CONTEXT FOR BIT PLANE BP
C8
OUTPUT BIT(BP,X) AS RESULT, WITH RESIDUAL CONTEXT
C9
BP == NBP?
C10
Y
N
BP++
C11
MORE PIXELS?
C12
N
Y
UPDATE FRAME STORE
C13
GET NEXT PIXEL
C14
END
C15

Fig. 6

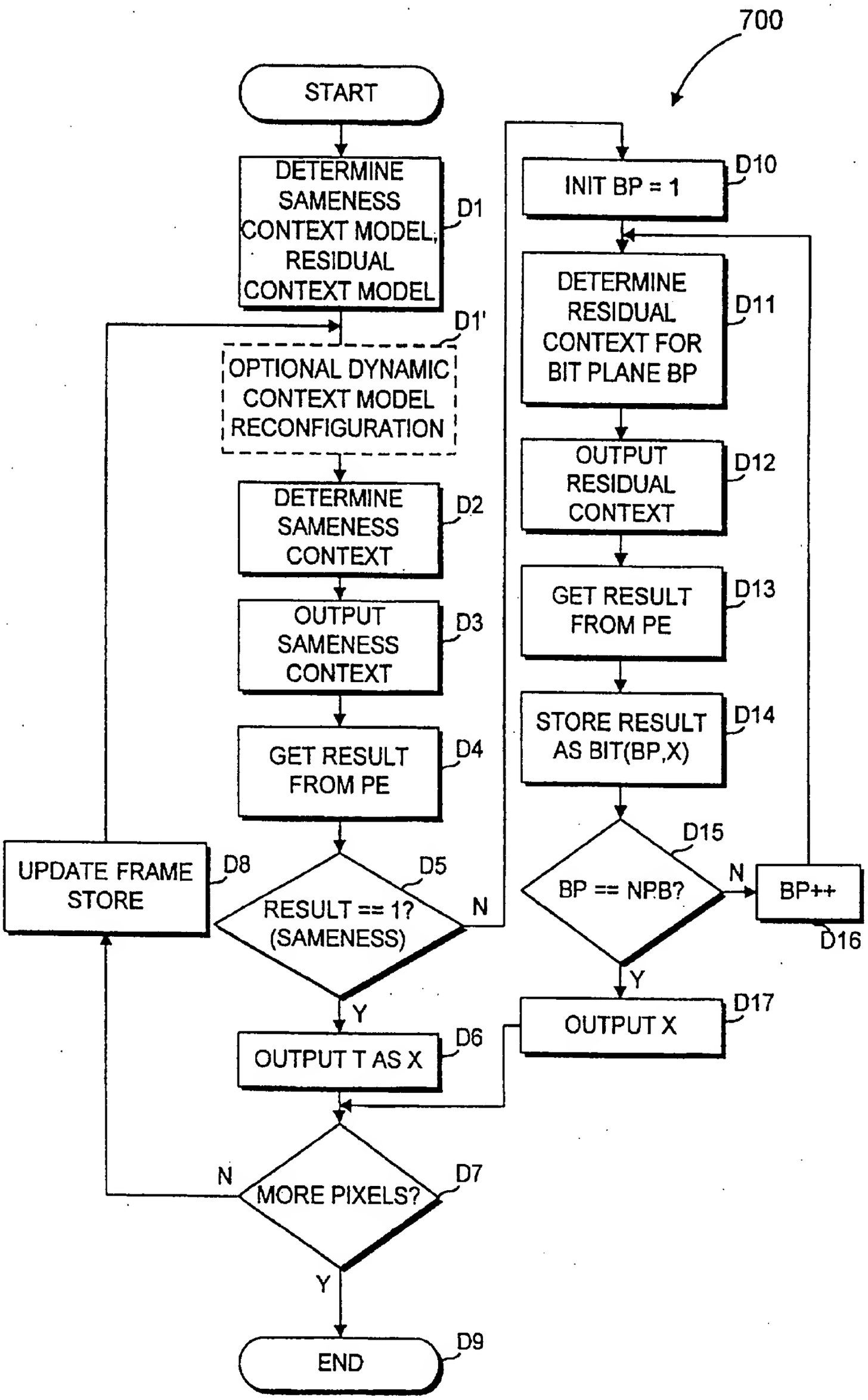

700
START
DETERMINE SAMENESS CONTEXT MODEL, RESIDUAL CONTEXT MODEL
D1
D1'
OPTIONAL DYNAMIC CONTEXT MODEL RECONFIGURATION
DETERMINE SAMENESS CONTEXT
D2
OUTPUT SAMENESS CONTEXT
D3
GET RESULT FROM PE
D4
RESULT == 1? (SAMENESS)
D5
N
Y
OUTPUT T AS X
D6
MORE PIXELS?
D7
N
Y
END
D9
UPDATE FRAME STORE
D8
INIT BP = 1
D10
DETERMINE RESIDUAL CONTEXT FOR BIT PLANE BP
D11
OUTPUT RESIDUAL CONTEXT
D12
GET RESULT FROM PE
D13
STORE RESULT AS BIT(BP,X)
D14
BP == NPB?
D15
N
BP++
D16
Y
OUTPUT X
D17

Fig. 7

DATA COMPRESSION FOR PALETTIZED VIDEO IMAGES

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of several applications using compression and decompression to efficiently store or transmit data;

FIG. 2 is a more detailed view of the compressor shown in FIG. 1;

FIG. 3 is a more detailed view of the decompressor shown in FIG. 1;

FIG. 4 is a more detailed view of the context modeller of the compressor shown in FIG. 2;

FIG. 6 is a flow chart of the precoding process performed by a context modeller; and

FIG. 7 is a flow chart of the decoding process performed by a context modeller.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 is a block diagram of a generalized application where compression is used.

FIG. 1 shows several data sources, such as a video cassette **102**, a still image **104**, a video sequence **105** and a workstation **106** which produces rendered images. Where the data source is image data, and especially sequences of image frames, compression is needed because of the large amount of memory needed for uncompressed images or sequences. The present invention is described with reference to frame sequences, however the present invention is useful with other types of data sharing similar characteristics of frame sequence data.

The data is input to a compressor **108** which, if designed correctly, outputs a compressed image or images containing fewer bits than the original data. If compressor **108** is a lossless compressor, the original data is exactly recoverable from the bits of the compressed data. Once the data is compressed, it is applied to a channel, several examples of which are shown in FIG. **1**.

FIG. 2 shows compressor **108** in greater detail, along with an original file **200** representing a sequence of uncompressed images (frames) and a compressed file **220** representing a compressed version of original file **200**.

Compressor **108** moves the original data through a context modeller **202C**, and an entropy coder **208C** to form compressed file **220**. Context modeller **202C** has an input for accepting original pixels and a pixel clock.

Context modeller **202C** is also coupled to a frame store **204C**, to update frame store **204C** with the current pixel and to read context pixels or context bits from frame store **204C**.

In operation, during each cycle of the pixel clock, compressor **108** accepts an input pixel (the "current" pixel) from file **200**, which contains the original pixels. In response to the current pixel, compressor **108** outputs a number of bits to compressed file **220**, where the number depends on the state of compressor **108**, and can be zero bits (i.e. no bits output in a given input pixel cycle). In the zero bit output case, the internal state of **108** is changed. This will be reflected in a later compressed bit or bits.

Context modeller **202C** accepts the input pixel and outputs one or more sets each of a context bin ID and a result value.

Context modeller 202C determines the context bin ID and result, according to methods explained in more detail below.

Initially frame store 204C is empty, so it might not be able to provide contexts for very early pixels. However, the frame store could just be filled with an a priori value so that contexts can be provided for every result. After the first frame, frame store 204C contains at least a full frame. As frame store 204C fills, the oldest pixels are overwritten as new pixels are stored. Frame store 204C need only be large enough to hold the values needed to determine future contexts. For example, if no context referred to pixel values from earlier than the immediately prior frame, storage is only needed for one full frame. .

FIG. 3 shows decompressor 122 in more detail, having many of the same elements as compressor 108. To distinguish similar elements of decompressor 122 and compressor 108, the elements of decompressor 122 are indicated by similar numbers but with a "D" suffix instead of a "C" suffix, such as context modeller 202D, frame store 204D, context model controller 206D and entropy decoder 208D comprising probability estimator 210D, context tables 212D. 214D. bit generator 216D and fractional bit storage 218D.

The update clock clocks update buffer **414** to update frame store **204**C after the context for the current pixel is obtained. Of course, if frame store **204**C has enough space to hold the current pixel without overwriting any pixels which form the context for the current pixel, then PCLK can be substituted for UCLK.

BP register **406**, comparator **410**, frame store **204**C, and CP register **408** each provide bits or pixels to full context register **412**.

The operation of context modeller **202**C during one pixel clock (PCLK) cycle will now be described. First, the current pixel is read into pixel register **402**. CP register **408** "addresses" frame store **204**C to obtain the context pixels for the current pixel. An exemplary context model is one where the pixel to the left of the current pixel forms the context. In this case, the pixel to the left would be read out of frame store **204**C, with CP register **408** indicating where the current pixel is, and thus where the "pixel to the left" is to be found. Some of the context pixels are compared by comparator **410** to one another and to the current pixel. As shown in FIG. **4**, the current pixel (designated "X") is compared to the pixel in the immediately previous frame which occupies the same pixel position as the current pixel does in the current frame (designated "T"). The result of this comparison is provided to control logic **404**C. The results of other comparisons, such as the pixel to the left compared with the corresponding pixel from a previous frame, are provided to full context register **412**.

FIG. **6** is a flow chart of the process followed by context-modeller **202**C to convert the current pixel into a result and a context for that result. First, context model controller **206**C determines the sameness context model and the residual context model and loads SMASK and RMASK (step C1). Once those are set, control logic **404**C cycles the pixel clock to load the current pixel into pixel register **402** (step C2). In some embodiments, control logic **404**C adaptively changes the masks in a causal manner.

Next, the sameness context is determined (step C3) by updating full context register **412** and masking with SMASK. If dynamic (adaptive) context modelling is used, the dynamic context model is determined first (step C3'). With the current pixel being X, the sameness test X==T is done (C4), and if that test result is true, a result value of 1 is output (C5) along with the sameness context of the current pixel. The sameness test tests whether or not the current pixel is the same as the corresponding pixel from a previous frame (i.e., whether the color of the current pixel changes from the previous frame). This test is represented by X==T and is performed by comparator **410**, which reads T from frame store **204**C and X from pixel register **402**. If X==T is true, no other information about the current pixel needs to be output.

After the residual bit output, the bit plane is compared to the number of bit planes (N BP), to check if it is the last bit plane (C10). If more bit planes remain, the BP register is incremented (C11), and the process repeats at step C8. Otherwise, the process continues at step C12, where a test is done to check if any more pixels remain to be compressed. This step also follows step C5. If more pixels remain to be processed, control logic 404C cycles UCLK to update frame store 204C (C13) and then cycles PCLK to get the next pixel (C14). If no more pixels remain, the process terminates (C15).

FIG. 7 is a flow chart of the decompression process which is described with reference to FIG. 3 as well as FIG. 7. This process is performed by decompressor 122, including context modeller 202D. Context modeller 202D is similar to context modeller 202C, except that context modeller 202D inputs a result and outputs an input, thus requiting different control logic.

Context modeller 202D checks the result (D5). If it is 1, indicating that the current pixel X was the same as T, context modeller 202D reads T from frame store 204D and outputs T as the current pixel (D6). Context modeller 202D then checks for more pixels (D7). If there are more pixels, frame store 204D is updated with pixel X (D8), otherwise the process ends (D9).

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US005404446A

United States Patent [19]

Bowater et al.

[11] Patent Number: 5,404,446

[45] Date of Patent: Apr. 4, 1995

[54] **DUAL BUFFER VIDEO DISPLAY SYSTEM FOR THE DISPLAY OF ASYNCHRONOUS IRREGULAR FRAME RATE VIDEO DATA**

[75] Inventors: Ronald J. Bowater, Romsey; Barry K. Aldred, Winchester; Steven P. Woodman, Romsey, all of England

[73] Assignee: International Business Machines Corporation, Armonk, N.Y.

[21] Appl. No.: 37,197

[22] Filed: Mar. 26, 1993

[30] Foreign Application Priority Data

Mar. 26, 1992 [GB] United Kingdom 9206554

[51] Int. Cl.[6] G06F 15/20

[52] U.S. Cl. 395/162

[58] Field of Search 395/101, 162, 164, 200, 395/250; 358/85, 86, 183, 903; 370/62; 380/18; 382/56; 345/185, 186, 189, 192, 196, 200

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IBM Technical Disclosure Bulletin, vol. 10, No. 1, Jun. 1967, pp. 34–36, H. E. Jenkins et al., "Asynchronous Control of Data Transfer".

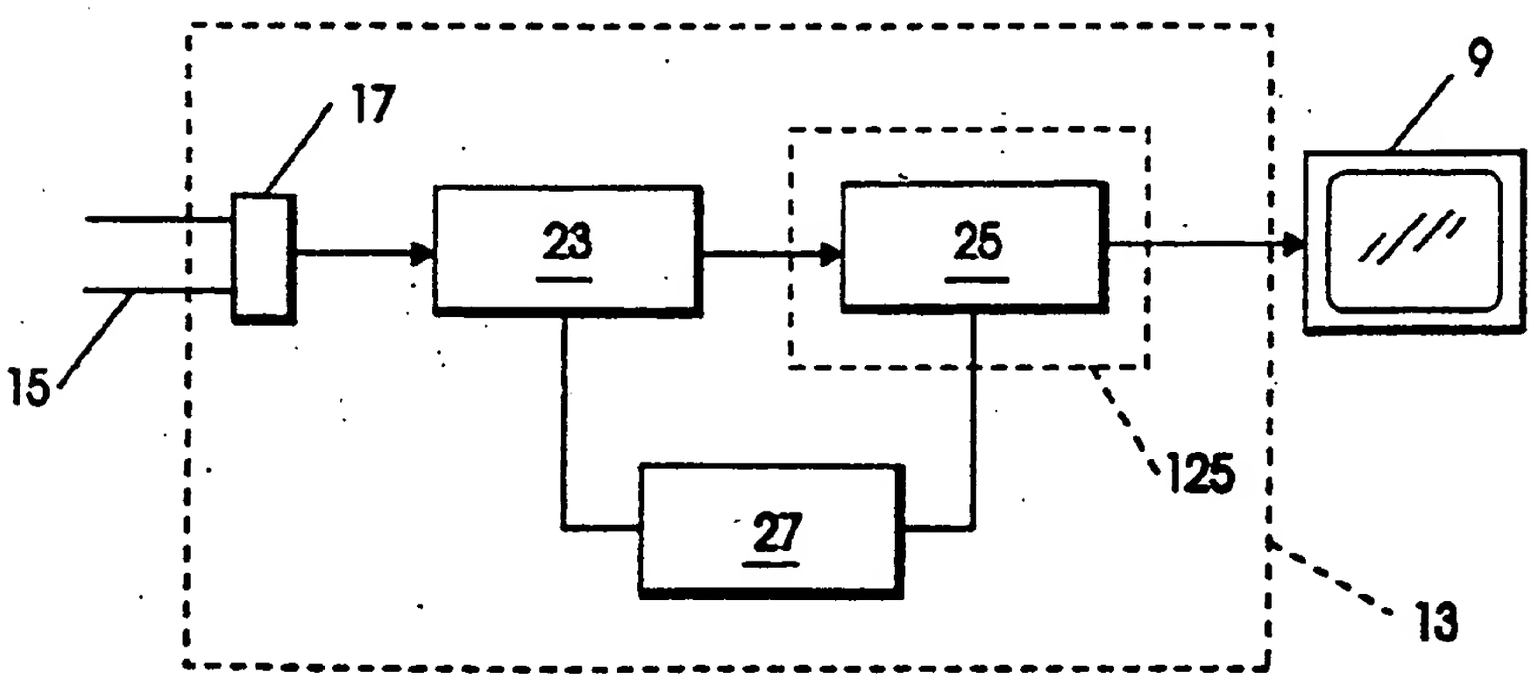
Primary Examiner—Mark R. Powell

Assistant Examiner—U. Chauhan

Attorney, Agent, or Firm—Martin J. McKinley

[57] ABSTRACT

7 Claims, 1 Drawing Sheet



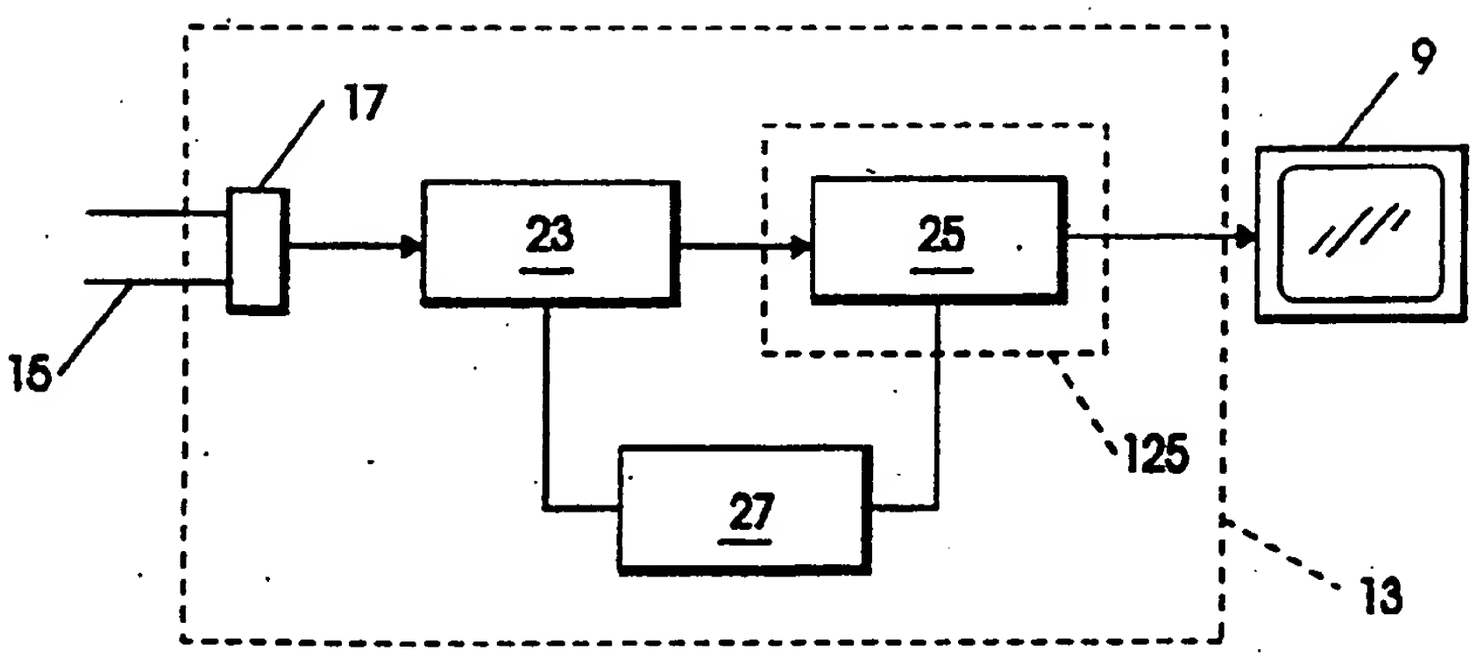
Docket no. 2134

EXHIBIT B

EXHIBIT B

FIG. 1

FIG. 2



Docket no. 2134

EXHIBIT B

DUAL BUFFER VIDEO DISPLAY SYSTEM FOR THE DISPLAY OF ASYNCHRONOUS IRREGULAR FRAME RATE VIDEO DATA

BACKGROUND OF THE INVENTION

In computer-based video communication systems, a video signal is obtained from the camera at a constant frame rate but, after transmission across the asynchronous or non-ideal network, the frames arrive at irregular intervals. Some frames arrive early, some are delayed, and bunching can occur. The display device at the receiving terminal, however, generally requires a constant frame rate supplied to it (e.g., to match the raster scan rate of a CRT). In such systems it is therefore necessary to match the irregular arrival of frames over the network with the constant supply required to the output screen.

. The designer of computer based video communication systems is therefore faced with the problem of how to achieve regular play-out of the asynchronous incoming video signal while, at the same time, minimising the number of buffered video frames.

With reference now to FIG. 2, the incoming video signal from the communication subsystem 15 arrives at the workstation 13 for display on the associated monitor 9. The signal is transferred first to a buffer 23, and then to the AMII card 125 or, more particularly, to the AudioVisual Kernel (AVK) interface buffer 25 of the AMII card. The buffer 23 provides a FIFO queue, conveniently implemented as a circular buffer. A control process 27 is responsible first for reading incoming data into the circular buffer, and then for transferring data from the circular buffer to the AVK.

However, the transmission rate over the network is variable, depending on network load, etc., so that the arrival rate at the end of the computer subsystem departs from this 15 Hz clock. Changes in CPU activity at the source and destination computers can also lead to variations in the effective frame arrival rate. Individual frames can have either a positive or negative offset from their nominal arrival time, although it is assumed that frames do, in fact, arrive in the correct sequence. It should be noted that the variation in arrival times is such that, even if the hardware could display each frame directly on arrival, the resulting sequence would be so temporally distorted as to be unwatchable.
essential.

Together, the AVK and circular buffer compensate for the variable arrival rate of the video frames by introducing a time-lag, T(L), between the received and displayed images. Any frame arriving within T(L) of its nominal arrival time can be properly displayed. Only if a frame arrives more than T(L) late, will the AVK and circular buffer empty and the video image will freeze. To decrease the risk of buffer starvation, the buffer size can be increased to make T(L) larger, but with a 15 frames per second transmission rate, storing only 10 frames adds a delay of ⅔ second. If the effectiveness of interactive applications such as video conferencing is not to be seriously degraded, only a handful of frames can be buffered with T(L) correspondingly small.

The control process is responsible first for receiving data into the circular buffer, and then for forwarding it to the AVK. There is no control over output from the AVK, which is at a fixed rate. As explained in more detail below, the AVK requests frames from the circular buffer as required. Clearly, if frames are present in the circular buffer, then these can be forwarded to the AVK. However, in video conferencing or other interactive applications where the overall amount of buffering is limited, there may occasionally be particularly long delays on the network during which time the circular buffer empties. In this case, the control process reacts by loading the AVK with null frames. A null frame is essentially the same as the preceding frame, so that, as far as the viewer is concerned, video image temporarily freezes. Thus, each time the control process fails to find frames in the circular buffer, the requisite number of null frames are loaded into the AVK instead.

Although the user may not notice the insertion of individual null frames, each null frame adds to the overall delay in the system (i.e., it is effectively another form of buffering). If more and more null frames are inserted into the video stream, then this will, again, lead to an intrusive delay between transmission and display. This problem can be overcome by the circular buffer throwing away real data when the delayed frames do finally arrive. These frames are then effectively lost, allowing the displayed image to catch up with the incoming signal. It is the presence of two buffers that gives the flexibility to lose frames in this way, and so cope with occasional delays longer than T(L).

The technique used to discard frames exploits the fact that, due to the limited bandwidth of the channel, the video signal is compressed before transmission over a computer based communication line. Basically, two types of compression, spatial and temporal, are used. In the former, the redundancy within a single frame is removed, for example, by using the fact that adjacent pixels often have closely related brightness and color values. A frame encoded using only spatial compression is known as a "still frame". Temporal compression achieves a further level of compression by exploiting the fact that the luminosity and color of the same pixel in two consecutive frames are, again, likely to be highly correlated. Therefore, in temporal compression, a frame is encoded as a "relative frame" in terms of its difference from the previous frame (we assume that a relative frame is also spatially compressed). The greatest reduction in data is achieved if every frame (apart from the first) is a relative frame, but this is highly error prone since the loss of a single frame will produce defects that persist for all subsequent frames. Therefore, as a compromise, every Nth frame can be sent as a still frame, with all intervening frames as relative frames, so that the result of compression is a regularly spaced series of frames whose size varies somewhat according to the temporal and spatial content of the data and, of course, whether that particular frame is a still or relative frame.

When the buffer is not full, then incoming frames can be added to the buffer in the normal way. However, when the buffer is full, there are two possible actions. If the incoming frame is a still frame, then the entire buffer is flushed before the incoming still frame is added to the queue. Alternatively, if the incoming frame is a relative frame, then only relative frames below (i.e., that arrived earlier than) a still frame are flushed. This is because the previous still frame is still required to make sense of the relative frames. In either case, flushing the buffer results in some frames being thrown away, and so the displayed image catches up slightly with the received image.

Turning now to the AVK, frames are read out from the AVK for display at a fixed rate. This leads to the possibility of buffer starvation if the AVK contains no more frames to read out to the screen. In such an eventuality, the AVK pipeline needs to be reset, requiring a considerable system overhead during which time the video image is not updated, in contrast to the circular buffer, which can be emptied and refilled without penalty.

Accordingly, a lower limit, V(L), is set for the number of frames in the AVK. This value is selected to substantially preclude buffer starvation yet, at the same time, not introduce an unacceptable delay. The control process responsible for transferring frames from the circular buffer to the AVK then tries to maintain the number of frames in the AVK as close as possible to but slightly above V(L).

Once the control process has determined the number of frames to transfer to the AVK, it can either send this as a single request, or as an appropriate number of requests for individual frames. In the latter case, the circular buffer can respond simply to each request by transferring a frame if available, or inserting a null frame if not.

Docket no. 2134

EXHIBIT B

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US005838678A

United States Patent [19]

Davis et al.

[11] Patent Number: 5,838,678

[45] Date of Patent: Nov. 17, 1998

[54] METHOD AND DEVICE FOR PREPROCESSING STREAMS OF ENCODED DATA TO FACILITATE DECODING STREAMS BACK-TO BACK

[76] Inventors: Joseph W. Davis, 2776 Peachtree Walk; Shawn M. Hayes, 1100 N. Court Dr., both of Duluth, Ga. 30136

[21] Appl. No.: 686,629

[22] Filed: Jul. 24, 1996

[51] Int. Cl.[6] H04J 3/24

[52] U.S. Cl. 370/389

[58] Field of Search 370/389, 493, 370/496, 498, 535, 536, 537, 538, 539, 540, 541, 542, 543, 474, 476, 477; 348/461, 462, 466, 467, 390, 395, 396, 394, 404, 409, 12, 13, 19, 607, 391, 400, 412, 384

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Primary Examiner—Dang Ton

Attorney, Agent, or Firm—Sawyer & Associates

[57] ABSTRACT

A method and device for preprocessing streams of encoded data (e.g. compressed in accordance with an MPEG standard) to permit a decoder to decode the streams, back-to-back (i.e., one stream immediately following another), without being reset and without producing video artifacts. The present invention includes verifying that a multiplexed stream complies with an encoding standard and preprocessing packets of the packetized encoded video sequence such that no video artifacts are produced when a video decoder decodes an adjacent encoded video sequence.

17 Claims, 16 Drawing Sheets

Docket no. 2134

EXHIBIT C

EXHIBIT C

FIG. 1
(PRIOR ART)

Docket no. 2134

EXHIBIT C

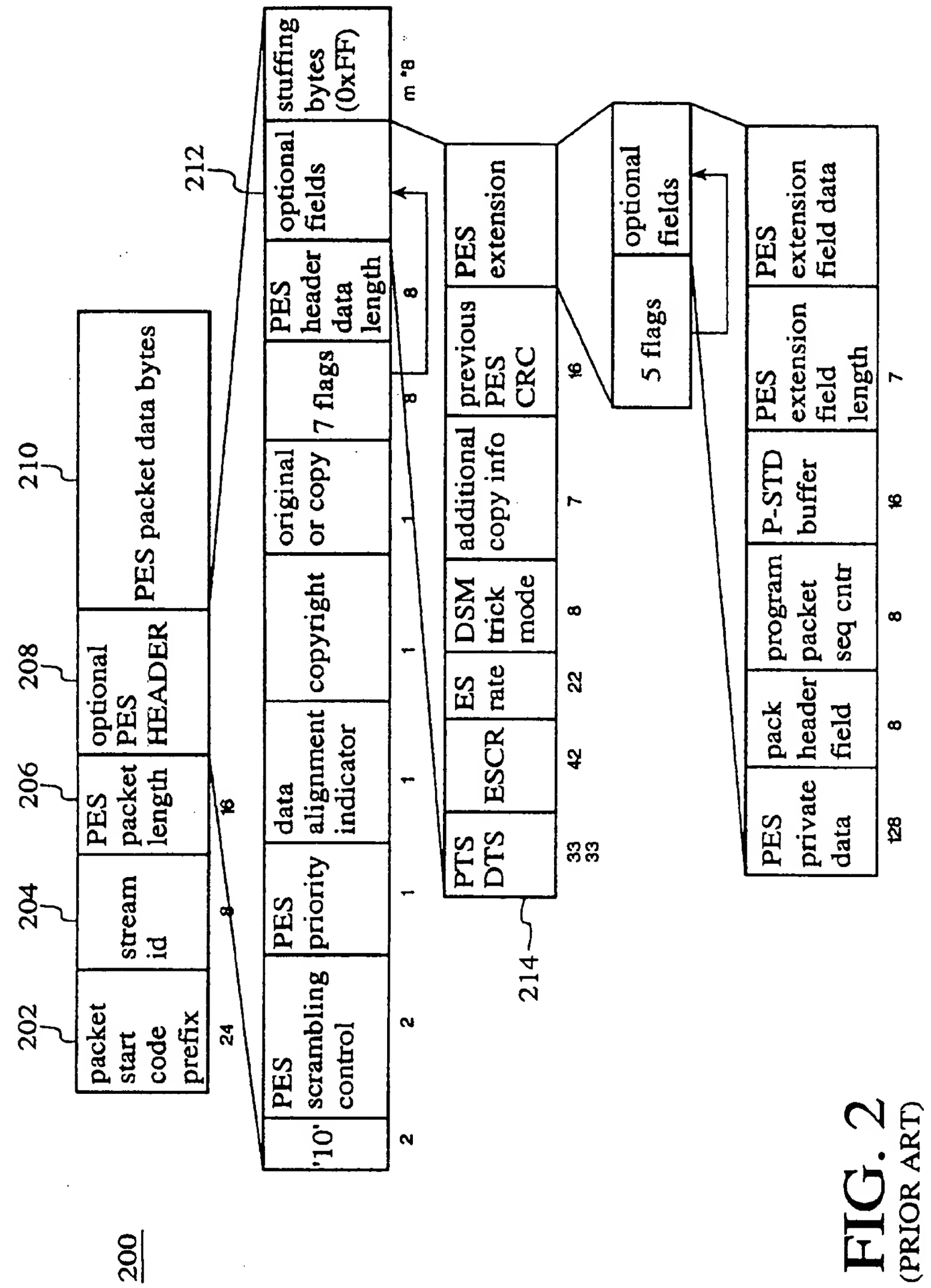

FIG. 2
(PRIOR ART)

Docket no. 2134

EXHIBIT C

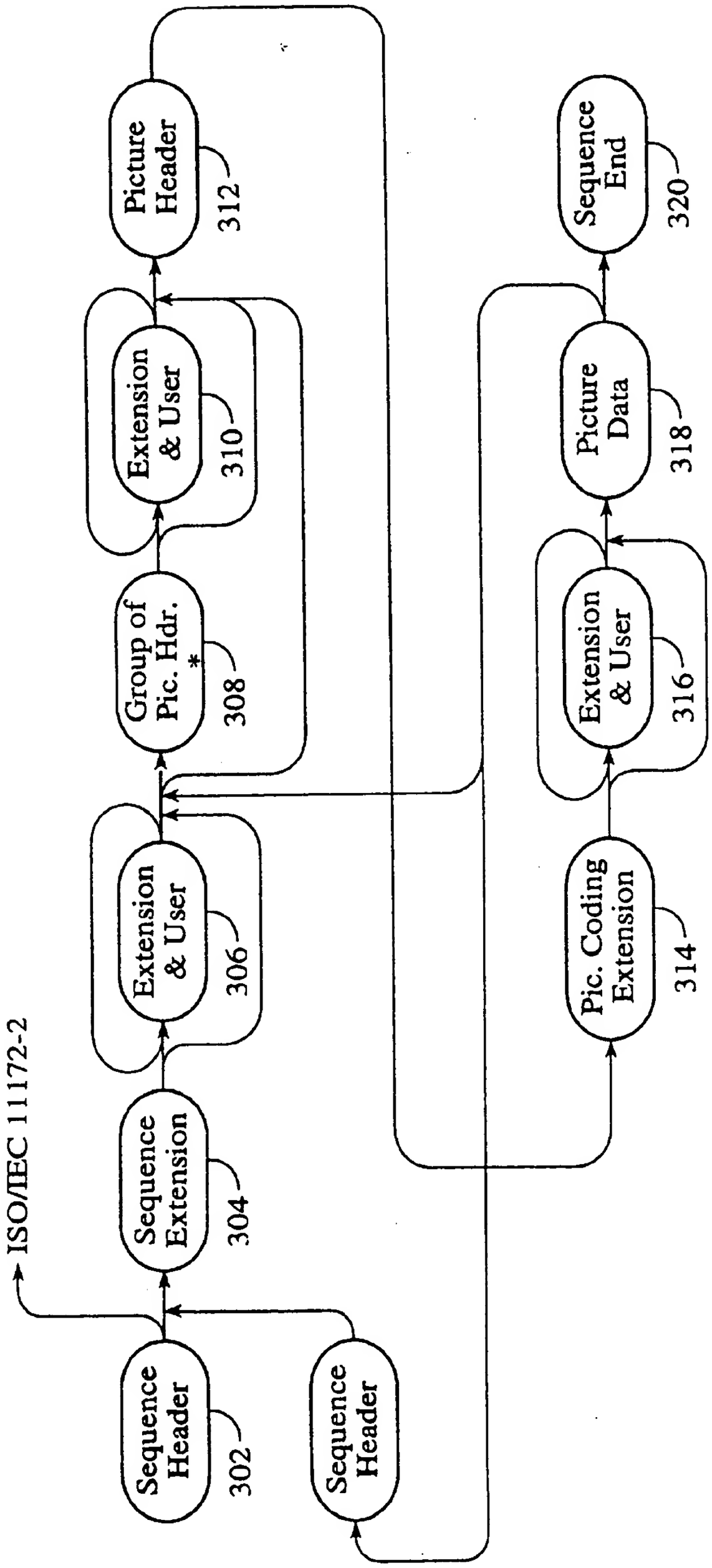

FIG. 3A
(PRIOR ART)

Docket no. 2134

EXHIBIT C

video_sequence0 { 300	No. of bits	Mnemonic
next_start_code0		
sequence_header0 302		
if (nextbits0 = extension_start_code) {		
sequence_extension0 304		
do {		
extension_and_user_data(0) 306		
do {		
if (nextbits0 = group_start_code) {		
308 group_of_pictures_header0		
310 extension_and_user_data(1)		
}		
312 picture_header0		
314 picture_coding_extension0		
316 extensions_and_user_data(2)		
318 picture_data0		
} while ((nextbits0=picture_start_code) ||		
(nextbits0 = group_start_code))		
if (nextbits0! = sequence_end_code) {		
sequence_header0		
sequence_extension0		
}		
} while(nextbits0!=sequence_end_code)		
} else {		
/*ISO/IEC 11172-2 */		
}		
sequence_end_code 320	32	bslbf
}		

FIG. 3B
(PRIOR ART)

Docket no. 2134 **EXHIBIT C**

FIG. 4
(PRIOR ART)

picture_header0 { 312	No. of bits	Mnemonic
picture_start_code 502	32	bslbf
temporal_reference 504	10	uimsbf
picture_coding_type	3	uimsbf
vbv_delay	16	uimsbf
if(picture_coding_type = 2 || picture_coding_type = 3) {		
full_pel_forward_vector	1	
forward_f_code	3	uimsbf
}		
if (picture_coding_type = 3) (		
full_pel_backward_vector	1	
backward_f_code	3	uimsbf
}		
while (nextbits0 = '1') {		
extra_bit_picture /* with the value '1' */	1	uimsbf
extra_information_picture	8	
}		
extra_bit_picture /* with the value '0' */	1	uimsbf
next_start_code0		
}		

FIG. 5 (PRIOR ART)

group_of_pictures_header0 { 308	No. of bits	Mnemonic
group_start_code ~604	32	bslbf
time_code	25	bslbf
closed_gop ~602	1	uimsbf
broken_link	1	uimsbf
next_start_code0		
}		

FIG. 6 (PRIOR ART)

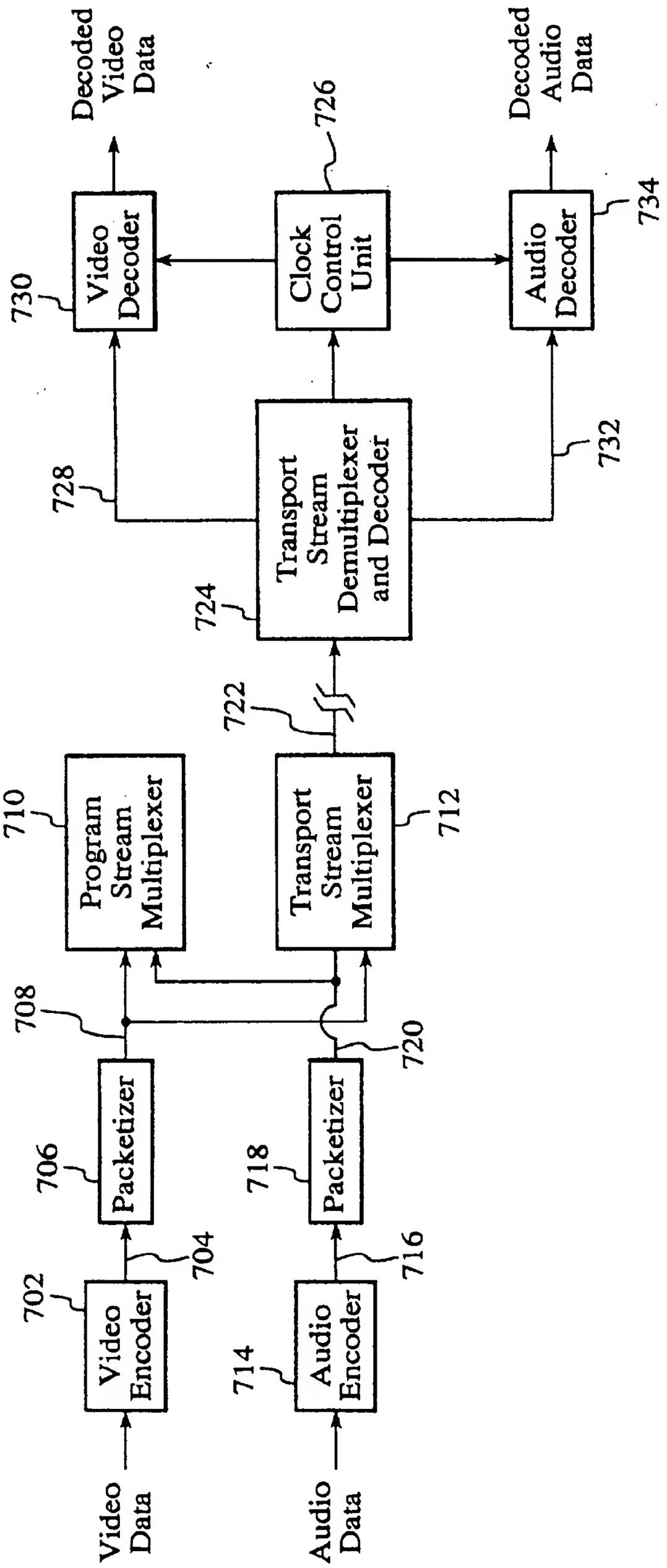

FIG. 7
(PRIOR ART)

FIG. 8

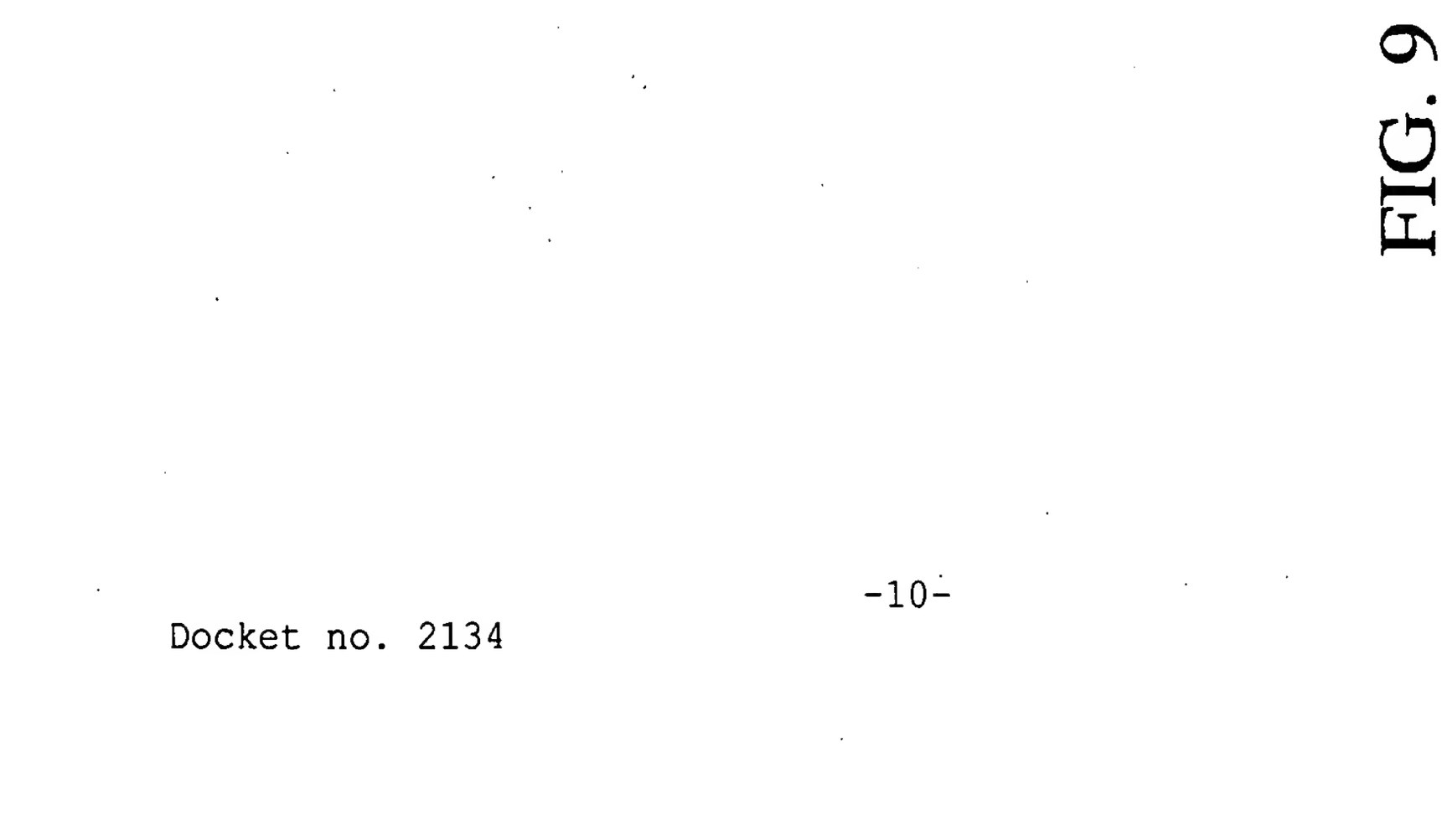

FIG. 9

FIG. 10

FIG. 11
(PRIOR ART)

Docket no. 2134

EXHIBIT C

FIG. 12

FIG. 13

FIG. 14

Docket no. 2134

EXHIBIT C

FIG. 15

Docket no. 2134 **EXHIBIT C**

FIG. 16

Docket no. 2134

EXHIBIT C

METHOD AND DEVICE FOR PREPROCESSING STREAMS OF ENCODED DATA TO FACILITATE DECODING STREAMS BACK-TO BACK

BACKGROUND OF THE INVENTION

a. Field of the Invention

b. Related Art

The MPEG standard focuses on the encoding and transport of video and audio data. In general, the MPEG standard uses compression algorithms such that video and audio data may be more efficiently stored and communicated.

The International Organization for Standardization (or the Organization International De Normalisation) (hereinafter referred to as "the ISO/IEC") has produced the MPEG II standard for the coding of moving pictures and associated audio. This standard is set forth in four documents. The document ISO/IEC 13818-1 (systems) specifies the system coding of the specification. It defines a multiplexed structure for combining audio and video data and means of representing the timing information needed to replay synchronized sequences of the audio and video data in real-time. The document ISO/IEC 13818-2 (video) specifies the coded representation of video data and the decoding process required to reconstruct pictures. The document ISO/IEC 13818-3 (audio) specifies the coded representation of audio data and the decoding process required to reconstruct the audio data. Lastly, the document ISO/IEC 13818-4 (conformance) specifies procedures for determining the characteristics of coded bitstreams and for testing compliance with the requirements set forth in the ISO/IEC documents 13818-1, 13818-2, and 13818-3. These four documents, hereinafter referred to, collectively, as "the MPEG II standard" or simply "the MPEG standard", are incorporated herein by reference.

A bit stream, multiplexed in accordance with the MPEG standard, is either a "transport stream" or a "program stream". Both program and transport streams are constructed from "packetized elementary stream" (or PES) packets and packets containing other necessary information. A "packetized elementary stream" (or PES) packet is a data structure used to carry "elementary stream data". An "elementary stream" is a generic term for one of (a) coded video, (b) coded audio, or (c) other coded bit streams carried in a sequence of PES packets with one and only stream ID.

FIG. 2 is a diagram which illustrates the syntax of a PES packet **200**. .

FIG. 7 is a high level block schematic showing a system for encoding, communicating, and decoding video and audio data in accordance with the MPEG II standard.

The transport stream multiplexer **712** multiplexes the encoded audio and video packets to form a transport stream **100** and provides the transport stream **100** to communications link **722**. At a remote end of the communications link **722**, a transport stream demultiplexer **724** receives the multiplexed transport stream **100**.

As mentioned above, transport streams **100** permit one or more programs with one or more independent time bases to be combined into a single stream. That is, a transport stream **100** may include a first program and a second program. In presently contemplated systems, both the video decoder **730**

and the audio decoder 734 must be reset before decoding a next program, for reasons which will be explained below. Thus, for example, in such systems there must be a temporal gap (e.g., one second) between the decoding of the first and second programs to permit the video and audio decoders 730 and 734, respectively, to be reset. This temporal gap precludes the playing of the second program directly following the first program. Moreover, it is difficult to determine when one program ends and another begins in real-time. Thus, a method and/or a device is needed to permit more than one program to be played (i.e., decoded) back-to-back. The method and/or device should also overcome, or avoid, the difficulties of determining program boundaries in real-time.

Thus, as can be appreciated from the above discussion of MPEG and MPEG II video encoding, the video decoder 730 often needs past and future frames to decode a picture (B-Picture) frame. If the last temporal (displayed) frame of a first program is used in decoding a first temporal (displayed) frame of a second program, or if a partial video frame is used, the output of the video decoder 730 will have been improperly decoded, disadvantageously causing video artifacts. Thus, as discussed above, the decoders must be reset between programs in known systems.

SUMMARY OF THE INVENTION

Specifically, the present invention provides a method for preprocessing multiplexed streams of packets of packetized, encoded, audio and video sequences such that an audio decoder can decode the encoded audio sequence to produce an audio sequence and a video decoder can, without being reset, decode the encoded video sequence to produce a video sequence. The method of the present invention (i) verifies that the multiplexed stream complies with an encoding standard, (ii) preprocesses packets of the packetized, encoded, video sequence such that no video artifacts are produced when the video decoder decodes an adjacent encoded video sequence, and (iii) preprocesses the packets of the packetized, encoded, audio data sequence such that its start time is within a first predetermined time of the start time of the video sequence and its temporal length is within a second predetermined time of the temporal length of the video sequence.

The step of preprocessing the packets of the packetized, encoded, video sequence preferably includes (i) deleting any video frames that cannot be decoded if video frames of the video sequence are not temporally correct, and (ii) deleting any video frames following a code indicating an end of the encoded video sequence. The step of preprocessing the packets of the packetized, encoded, audio sequence preferably includes (i) removing any partial audio frames, (ii) adjusting (i.e., adding or deleting) the number of audio frames, if necessary, such that the audio and video sequences start within the first predetermined time, and (iii) adjusting (i.e., adding or deleting) the number of audio frames, if necessary, such that the temporal lengths of the audio and video sequences are within the second predetermined time.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 2 is a diagram which illustrates the syntax of an MPEG II PES packet.

FIGS. 3*a* and 3*b* illustrate the organization of an MPEG II video sequence.

FIG. 4 illustrates the structure of a sequence header of the MPEG II video sequence of FIGS. 3*a* and 3*b*.

FIG. 5 illustrates the structure of a picture header of the MPEG II video sequence of FIGS. 3*a* and 3*b*.

FIG. 6 illustrates the structure of a group of pictures header of the MPEG II video sequence of FIGS. 3*a* and 3*b*.

FIG. 7 illustrates an encoding, transmission, and decoding system envisioned by MPEG II.

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EXHIBIT C

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EXHIBIT C

EXHIBIT C

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Docket no. 2134

EXHIBIT C

Docket no. 2134

PENDING AMENDED INDEPENDENT CLAIM 1
UNITED STATES PATENT APPLICATION SERIAL NO. 09/168,664

Twice Amended Text	Gormish, et al. patent	Bowater et al. patent Davis et al. patent
A method for producing a compressed video bitstream that includes compressed video data for a plurality of frames from data that specifies a single still image, the method comprising the steps of:	Disclosed in the Gormish, et al. patent. Not disclosed in the Gormish, et al. patent.	Disclosed in the Davis, et al. patent. Not disclosed in either the Bowater, et al. or Davis, et al. patents.
fetching the data for the single still image;	Not disclosed in the Gormish, et al. patent. The Gormish, et al. patent discloses a method for processing: 1. sequences of image frames; or 2. other types of data sharing similar characteristics of frame sequence data. (Col. 4, lines 55-58)	Not disclosed in either the Bowater, et al. or Davis, et al. patents.

EXHIBIT D

Applicant : Mark D. Conover
Serial no : 09/168,644
For : ENCODING A STILL IMAGE INTO COMPRESSED VIDEO
Art Unit : 2613

Docket no. 2134
Filed: October 8, 1998

Examiner: Richard Lee

encoding the data for the still image into data for an intra ("I") frame;	The Gormish, et al. patent does not disclose: 1. encoding compressed video data; 2. **from data that specifies a single still image**. The Gormish, et al. patent discloses a method for encoding a sequences of image frames which contain pixel values for a still image.	Not disclosed in either the Bowater, et al. or Davis, et al. patents.
storing the encoded I frame data; and	Not expressly disclosed in the Gormish, et al. patent.	Not expressly disclosed in either the Bowater, et al. or Davis, et al. patents.

EXHIBIT D

assembling the compressed video bitstream by appropriately combining data for: at least a single copy of the stored I frame; at least one null frame; and various headers required for decodability of the compressed video bitstream;	Not disclosed in the Gormish, et al. patent.	The Davis, et al. patent discloses assembling a compressed video bitstream. The Bowater, et al. patent discloses inserting null frames into compressed data to freeze an image's display during intervals in which a workstation becomes starved for data.
whereby decoding of the compressed video bitstream produces frames of video which produce images that do not appear to pulse visually.	Not disclosed in the Gormish, et al. patent.	Not disclosed in either the Bowater, et al. or Davis, et al. patents.

EXHIBIT D